

MODERN Machine Shop

November, 1949

**"ROCKWELL"
HARDNESS TESTER**
Made Only by Wilson

**DELIVERY
FROM STOCK**



WILSON

MECHANICAL INSTRUMENT CO., INC.

AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

230-G PARK AVENUE, NEW YORK 17, N. Y.

ACCO





A 5 Day Job Done in 10 Hours!
PROFILE MILLING STAINLESS STEEL
with GORTON and Tracer Control

This experimental short run job was done on a Gorton Profiling Pantograph with a simple, over-size master and tracer control for the Elliott Company of Jeannette, Pa.

Completely automatic tooling for a production run would save an additional 6 hours. Compare this with any other method.

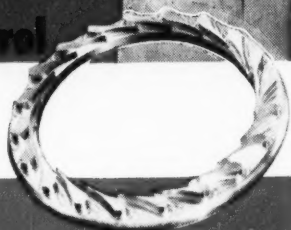
This is just one example of cost saving made possible with Gorton Tracer Controlled Equipment which includes die and mold duplicators, pantograph machines, super-speed vertical mills and plain type horizontal mills. Gorton features high spindle speeds, wide versatility and high precision.

Ask for Production Estimate . . .

We will be glad to furnish a production estimate on your work — send us complete description with prints — no obligation.

SEND FOR BULLETIN 1655 TODAY!

This provides information on all Gorton tracer-controlled machines.



THE JOB IN BRIEF

MATERIAL — Stainless Steel
OPERATION — Profile 20 turbine blades $\frac{1}{2}$ " deep from the solid in a circle 13.155" outside diameter.
FIXTURES — Gorton Rotary Table and 5 times-size master cut from sheet iron.
CUTTERS — 2 carbide 2-flute and 2 H.S. Steel 4-flute.
TIME — 10 hours. Finish better than 30 micro inches. Time Saving over any other method 40 hours or better.
REMARKS — Tooling for Automatic high production work, the time would be cut to 4 hours.

GEORGE GORTON MACHINE CO.
Tracer Controlled Milling

1711 RACINE STREET • RACINE, WISCONSIN, U. S. A.



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GOOD LEAD ON THREADS

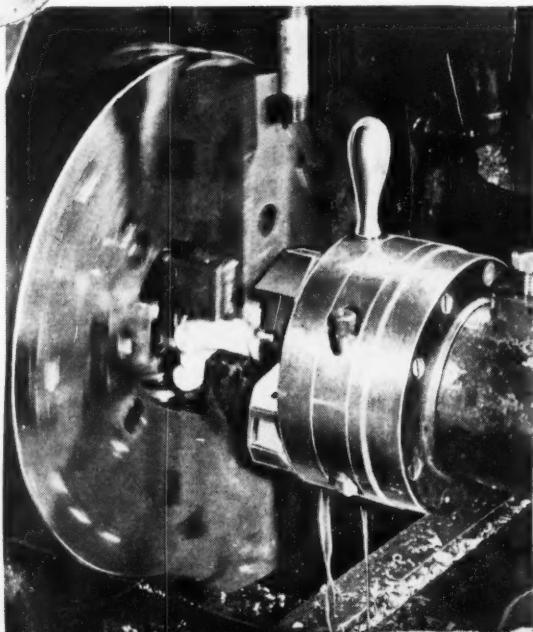
with LANDMATIC HEADS



The permanent nut action of Landis Tangential chasers assures accurate pitch threads throughout these crown port closing bodies used in bottling machinery. Landmatic Heads using Landis Tangential chasers cut $1\frac{5}{8}$ " 16 pitch USS threads $\frac{1}{2}$ " long on naval bronze forgings at the rate of 50 SFM. Actual threading time is about 5 seconds.

The permanent throat feature of the chasers maintains initial cutting accuracy throughout the entire life of the tool. When the chaser is reground, no grinding is done on the throat. Thus the throat angle and nut action is never altered and enables the chaser to consistently produce threads accurate for lead. For further information, on Landis Die Heads & Tangential chasers, write for Bulletins F-80, F-90 & A-50.

These photographs were taken in the Machine Manufacturing Division of the Crown Cork & Seal Company, Inc., Baltimore, Maryland.



LANDIS Machine CO.

WAYNESBORO
PENNA., U.S.A.

Here's How the Heald

UNIVERSAL FIXTURE

can speed up your
small-lot boring

- Ideal for handling a wide variety of work
- Permits fast, easy setups
- Cuts changeover time

Where a Heald Bore-Matic is used to handle many different pieces of work, with short to medium-length runs, a special fixture for each piece would be impractical. You can get the same results, however, with the Heald Universal Type Fixture, designed for use with Model 321 and Model 221 Bore-Matics.

This versatile work-holding device is provided with a cross slide and vertical slide which are operated manually at right angles to each other, permitting precision alignment of any part, quickly and easily. It can be supplied with practically any desired type of face plate, for either fixed or rotary indexing. This fixture will give your Bore-Matic extra versatility and ease of setup, with minimum down time for frequent changeovers. The gage blocks shown below in the rack on the machine table aid in the accuracy of these changeovers.

Your nearest Heald representative will be glad to give you the complete story on this Universal Type Fixture—as well as the Heald Bore-Matics with which it can be supplied.



**PRECISION INTERNAL AND
SURFACE GRINDERS**

**PRECISION BORE-MATIC
FINISHING MACHINES**

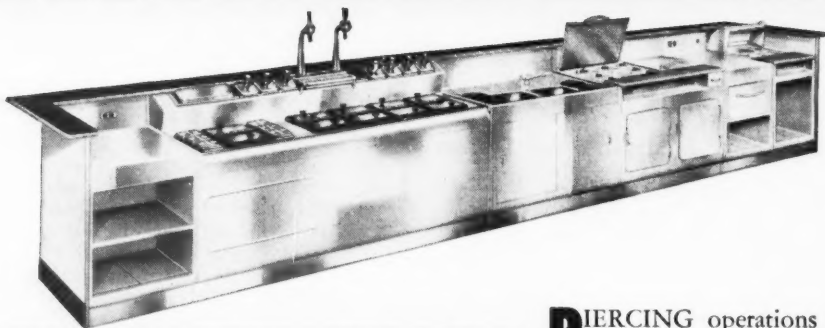
THE HEALD MACHINE COMPANY
Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton
Detroit • Indianapolis • Lansing • New York

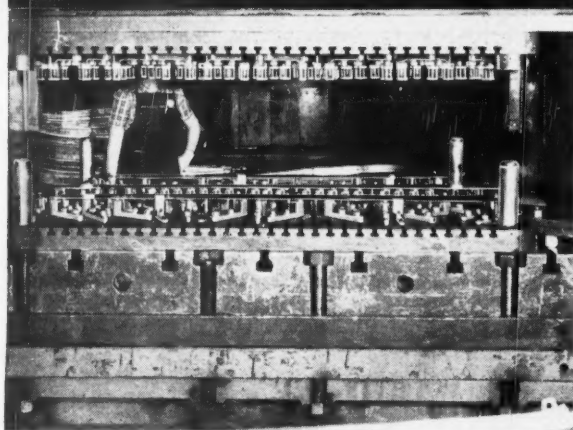
64 DIFFERENT SIZES OF VALVE BODIES, as well as a score of other miscellaneous parts, are handled by this Heald Universal Type Fixture, installed on a Model 321 Bore-Matic.



INCREASE PRODUCTION EFFICIENCY WITH WHISTLER ADJUSTABLE DIES



HOLES PIERCED SIMPLE, FAST AND ECONOMICAL...



If you're interested in getting more production at less cost in your perforating operations, get the facts on Whistler Adjustable Dies. They're used by over 1000 leading manufacturers. Write for your catalog today.

PIERCING operations necessary in producing a 22' Four-Train layout are no problem when Whistler Adjustable Dies are used. Set-ups for perforating, notching, slotting and rounding take less time. Precision is assured on long and short runs. Change can be made without tying up press production.

The real savings are in the continued re-use of the same dies on different jobs. Punch and die units can be rearranged. New sizes and shapes can be added. The heavy-duty units easily pierce materials up to and including $\frac{1}{4}$ " mild steel.

The new HU-50 Perforating unit that pierces at 90° angle can be used in the same set-up with other Whistler perforating dies.

S. B. WHISTLER & SONS, INC.
740 Military Road, Buffalo 17, N.Y.

◀ Typical press set-up of Whistler Adjustable Dies simplifies complicated piercing pattern.



CLOSE-UP...



of the bonus
you get with
every Farrel
Speed Reducer

The gears used in Farrel speed reducers have a *backbone* instead of the useless center groove found in some herringbone gears. This *backbone*, formed where the helices meet to make the teeth continuous across the face, gives you a real bonus in power transmission. It puts the entire width of the gear to work, providing greater capacity to withstand shocks, stresses and heavy loads.

Other features of these units include rigid and accurately ground shafts properly mounted in roller bearings, and heavy-section cases that hold rotating elements in precise alignment.

For the full story of the many features of Farrel speed reducers, send for a copy of new Bulletin 449.

Farrel-Birmingham Co., Inc., 344 Vulcan St., Buffalo 7

Plants: Ansonia and Derby, Conn., Buffalo, N.Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Los Angeles, Tulsa, Houston

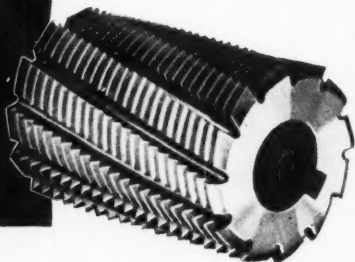
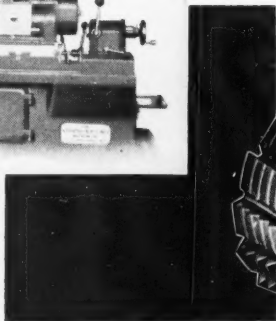
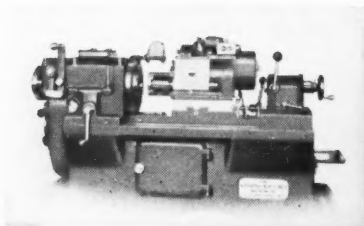


Farrel-Birmingham

FB-530

STOP COSTLY SPOILAGE

use
Hanson-Whitney
multiple thread
Milling Cutters



Shell Type Cutter for external thread milling, Thread Rolling Dies, etc.



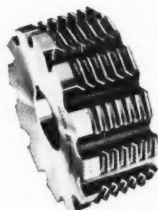
Taper Shank Cutter for internal thread milling.

H-W Ground Multiple Thread Milling Cutters are finished all over, AFTER hardening, to the closest of limits.

Angle of thread, relief and spacing of threads are very accurately controlled. Teeth can be spaced minus or plus to compensate for hardening variations in the product... a valuable feature on Cutters for Milling Thread Rolling Dies, as teeth can be spaced minus, to compensate for Helix Angle of thread.

Used in combination with H-W Thread Millers, H-W Cutters will give you 100% perfect threads on a production basis... without COSTLY SPOILAGE.

If you're having threading problems...here's the solution.



Shell Type Cutter for short external threads.

HANSON-WHITNEY MACHINE CO., HARTFORD 2, CONN.

Division of Whitney-Hanson Industries, Inc.

Hanson Whitney

For practical recommendations submit your problems to Hanson-Whitney engineers.



*111111

Can you take advantage of this **REAL ECONOMY?**

**THIS
2"
TURRET
LATHE**

GISHOLT No. 4 UNIVERSAL RAM TYPE TURRET LATHE

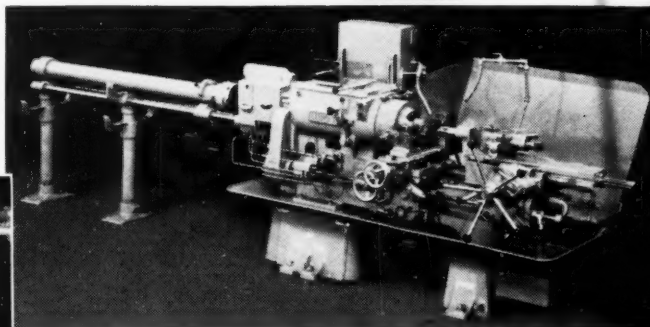
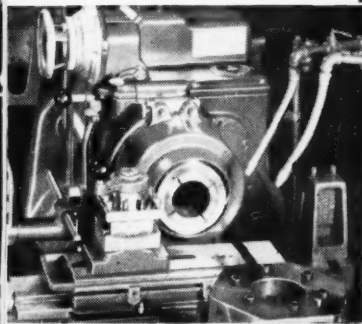
You don't have to invest in expensive heavy-duty lathes to handle large diameter work of this nature. Here is the ideal lathe to machine tubing, plastics, or lightweight bar stock such as aluminum. You can use it for softer metals like brass, too.

The Gisholt No. 4 Ram-Type Turret Lathe (normally 2" bar capacity) can be furnished with a larger spindle bore providing $4\frac{1}{2}$ " round collet capacity. This machine gives you all the modern operating advantages which mean high speed production and low costs. It may be the economical solution to your problem. Ask your nearest Gisholt representative about it. Or write us for complete information.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

**HAS
 $4\frac{1}{2}$ "**

**COLLET CAPACITY
for tubing, plastics and
lightweight bar stock**



The Gisholt No. 4 Ram-Type Turret Lathe with $4\frac{1}{2}$ " round collet capacity and equipped with $4\frac{1}{2}$ " bar feed. (At left) Close-up view of $4\frac{1}{2}$ " capacity collet chuck. This machine is ideal for large diameter tubing.

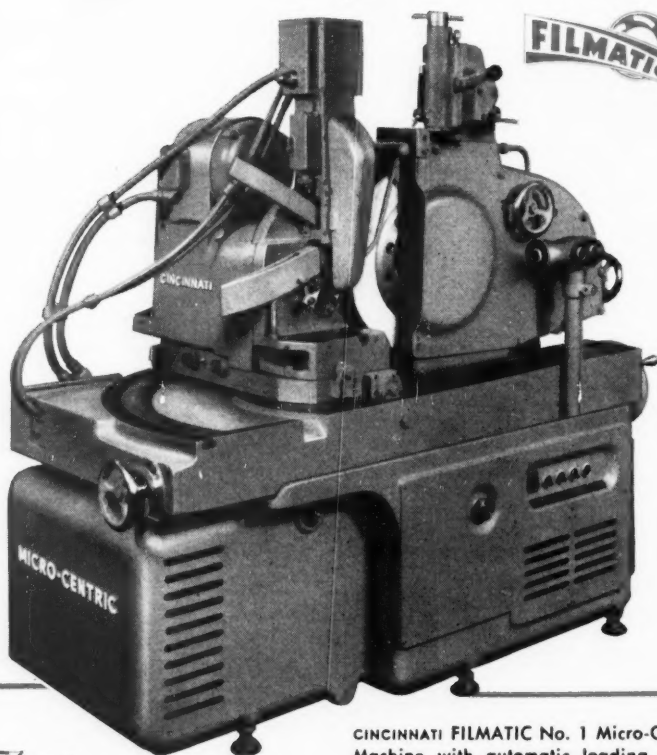
THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.



TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

**CENTER TYPE
GRINDING**

**CENTERLESS
GRINDING**



CINCINNATI FILMATIC No. 1 Micro-Centric Grinding Machine with automatic loading fixture. Manual or automatic loading fixture optional. Complete details in catalog G-573.

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

NOW!

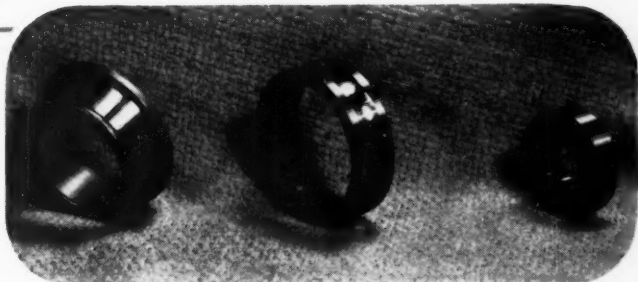
MICRO-CENTRIC GRINDING

CINCINNATI FILMATIC Micro-Centric grinding is a new, low cost method of obtaining exceptionally close three-way accuracy: 1) sizing, 2) roundness, and 3) squareness with one end of the part. It is made possible by a new method of work rotation and support, incorporated in CINCINNATI FILMATIC Micro-Centric Grinding Machines. Without working from centers, true roundness is generated within .000025", and squareness with one end within .000025".

These machines are suitable for grinding short work, such as bearing races and other parts like those shown in the illustration. Two sizes are available: No. 1, capacity $\frac{3}{4}$ " to $3\frac{1}{2}$ " diameter; No. 2, capacity 2" to 8" diameter.

Investigate Micro-Centric's low cost method of producing closer accuracy than hitherto obtainable on a production basis. Complete information is yours for the asking.

Typical Micro-Centric ground parts. Accuracies of roundness and squareness with one end within .000025" can readily be obtained.



it will pay you
to know more about
this versatile machine



KNIGHT NO. 40

for
**Precision Boring
and Vertical Milling**

Smaller machines of this type, No. 30 and No. 20, are available and shown in the Knight Catalog

W. B. KNIGHT MACHINERY CO., 3920 West Pine, St. Louis 8, Mo.
We would like to have your catalog on the No. 40 and other Knight Milling Machines.

Name _____

Title _____

W.B.KNIGHT
MACHINERY COMPANY

3920 WEST PINE BLVD.
ST. LOUIS 8, MISSOURI



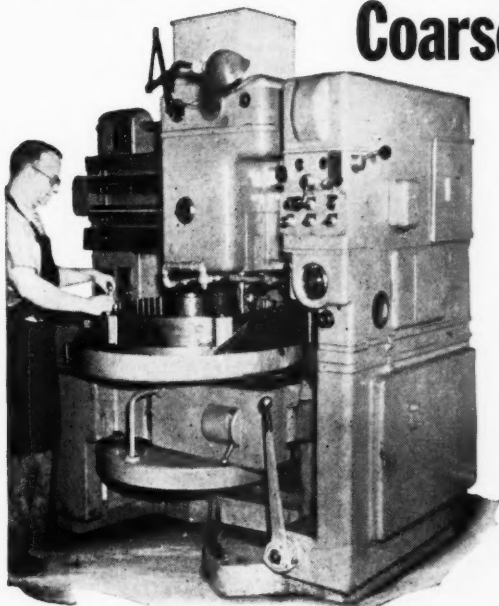
MORE GOODS for MORE PEOPLE at LOWER COST

if man-hours are a major factor in your cost picture, the Knight No. 40 will help you reduce them.

With a Knight No. 40 no special jigs or fixtures are required to handle the majority of your difficult boring, shaping or milling jobs. Flexibility and capacity, found in no other machine of comparable size, is provided by the tilting, swivel table, an unusually large working area, plus an exceptionally wide range of spindle and table feeds and speeds. Accuracy and long service far above the average are promised by the rugged, massive construction, wide bearing surfaces and precision gearing.

Time-wasting transfers of work, between two or more machines, are reduced to an absolute minimum. Set-up time is virtually eliminated. There are numerous other benefits, in cost reduction, increased output and product improvement, which you should know about. The coupon will bring you all the details without obligation.

RECORD TIME RATES on Big, Coarse-pitch Gears



Fellows 36-inch Gear Shaper
installed at Pawling & Harnischfeger

New FELLOWS 36 inch Gear Shaper an All-purpose machine

Time saving is mighty important in either production or jobbing shop gear cutting. The 36-inch Fellows machine is so ruggedly built that it is capable of taking extremely heavy cuts, and at the same time produces a smooth finish with a high degree of accuracy.

This all-purpose machine is adapted to the cutting of external spur and helical gears up to 36 inches pitch diameter, as well as a large variety of non-gear work. Contact our nearest office for full information on this newest of heavy-duty Fellows Gear Shapers.

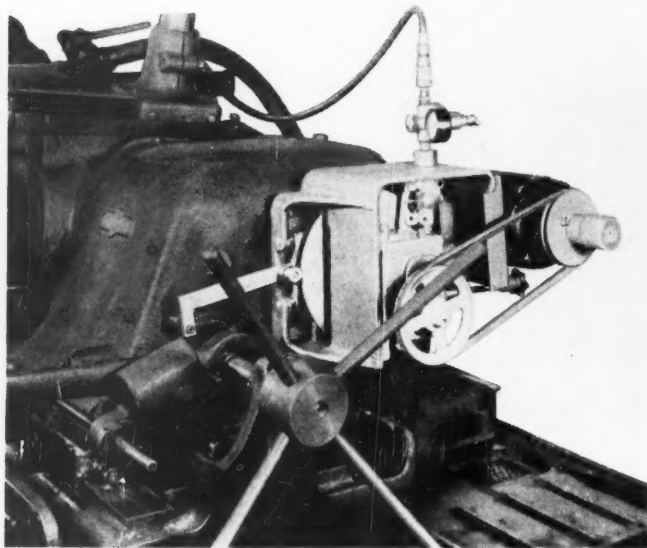
Fellows

The Fellows Gear Shaper Co., Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Building, Detroit 2; 640 West Town Office Building, Chicago 12; 7706 Empire State Building, New York 1.

Now

**OPERATE YOUR CENTERLESS
GRINDER**

Automatically



The **NEW AUTO-FEED** Attachment, for Cincinnati Centerless Grinders, produces work **FASTER, BETTER**, and at a **LOWER COST**. The **AUTO-FEED** is a tested and proven product; ruggedly built, easily operated. This is just the equipment you need to shorten delivery dates. Write today for full particulars.

Only

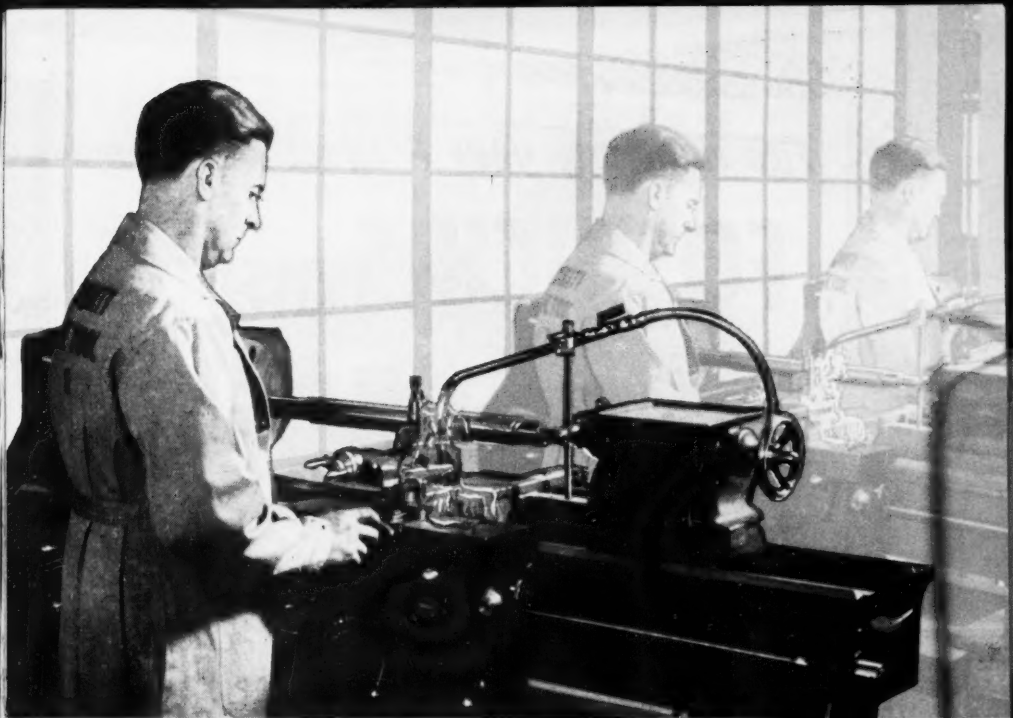
**AUTO-FEED
OFFERS ALL
THESE
FEATURES**

1. Easy, Simple Installation
2. Works directly off the lead screw for greater accuracy.
3. Can be changed from hand to automatic operation, and back again, almost instantly.
4. Uniform Feed.
5. Increases Production.
6. Handles All Types of Infeed Work, Including Shoulder and Taper Grinding.

BENNETT EQUIPMENT COMPANY

4727 ELLERY ST.

DETROIT 7, MICH.



Operators see **PINK . . .** and love it

THE PINK they see is Cimcool,[®] the revolutionary cutting fluid that makes the working picture a lot rosier. For Cimcool isn't subject to rancidity and objectionable odors. It's a *chemical emulsion*. Can't burn. Can't smoke. Has no unpleasant odor of its own.

And there are more reasons why operators prefer the job with Cimcool in the machines. Cimcool is clean to work with, doesn't soil hands or clothes. Leaves no hazardous slippery film on hands, machine, work or floor. Contains no skin irritants. And Cimcool cools so fast that tools and chips actually stay cool to the touch. You'll get better production when operators see pink—see CIMCOOL on the job.

Write for free booklet, "CIMCOOL Gives the Answers." Address, Sales Manager CIMCOOL Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

[®]Trade Mark Reg. U. S. Pat Off.

**A Production-Proved
Product of**
THE CINCINNATI MILLING
MACHINE CO.



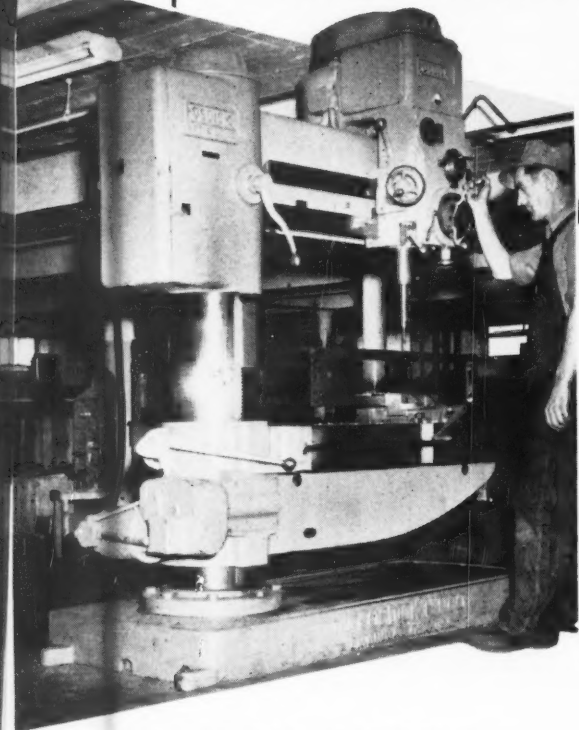
for

85%

OF ALL METAL CUTTING JOBS

Fits right into your Production Scheme

FOSDICK Sensitive RADIAL



This shows a Fosdick Sensitive Radial in operation at the Borden Mills Plant, Kingsport, Tenn. You'll find them saving time and costs in plants all over the country from Maine to California, and from Canada to Texas.

Our new bulletin gives all the details of construction and fully describes its modern features. Write for the FOSDICK Sensitive Radial Bulletin S.R. M.M.S.

Because of its high utility factor this machine fills the gap between the large Radial and the Sensitive and Upright Drills. It fits right into the production scheme of both large and small shops.

It has the sturdy construction and flexibility of Radial design plus the high speed characteristics of the Sensitive Drill.

The heavy base construction—the one-piece column—and the adjustable swinging table assure unusual rigidity for sensitive drilling operations. The arm is at a fixed height within easy reach of operator on all jobs. Both table and arm swing in an arc of 360°.

The nine speeds and four feeds are controlled by means of direct reading levers on the head. Thus all operating feeds and speeds are easily attained from the operator's normal working position.

This comparatively new machine is finding its way into hundreds of plants where there are small pieces requiring a number of holes to be drilled. Perhaps it will fit into your production scheme at a cost that is surprisingly low.

FOSDICK

MACHINE TOOL CO.
CINCINNATI 23, OHIO



**SAVE 10%
and more**

WITH
Jarvis
TECNI-TAPS

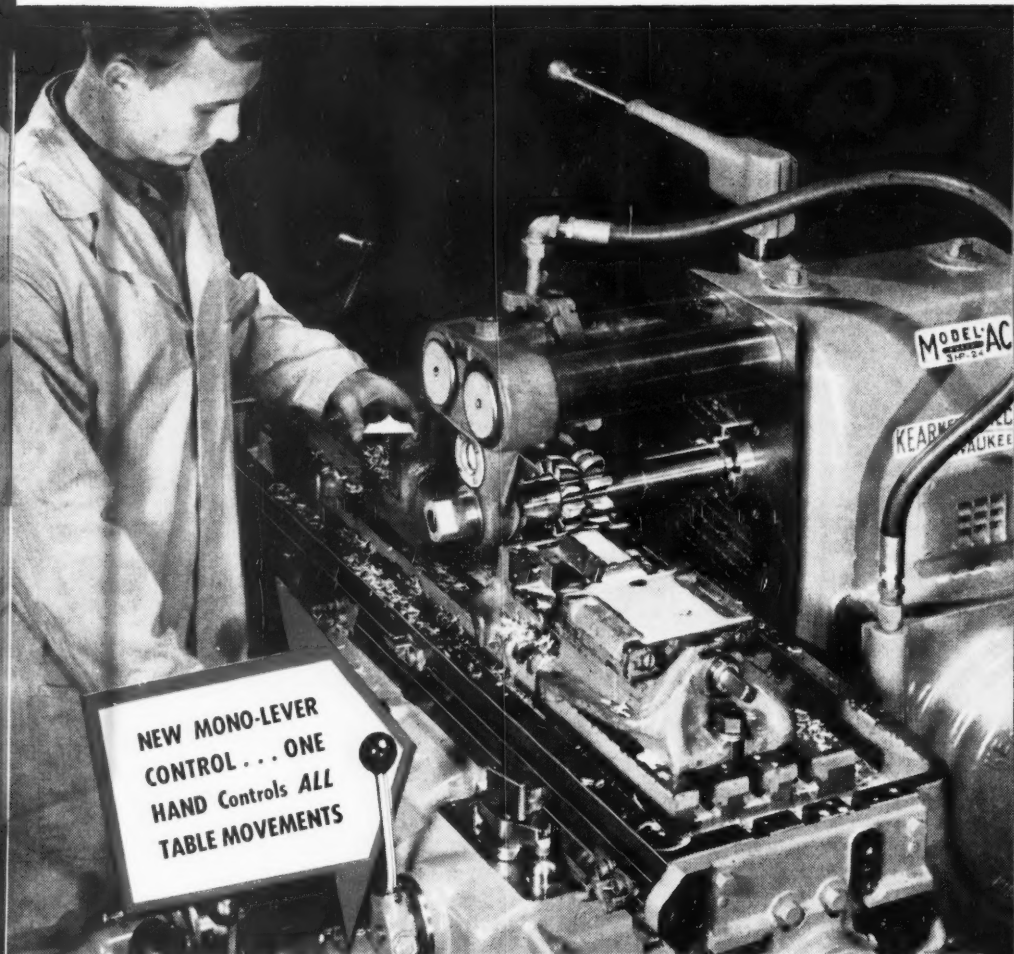
Ground-from-the-solid, Jarvis high-speed steel TECHNI-TAPS save you 10%, and more, on procurement costs alone. Jarvis TECHNI-TAPS have not gone up in price. Substantial savings are made when you work with Jarvis factory-trained representatives. Details, like number of flutes, lands, proper chamfer, are determined by these experts to create the TAP best suited to your tapping job. To get the most in profitable, trouble-free service from your TECHNI-TAPS, investigate the Jarvis TORQOMATIC tapping attachment — there are savings for you with TORQOMATIC too! Address your requirements to The Charles L. Jarvis Co., Middletown, Conn.

Jarvis
**POWER
TOOLS**

TAPPING ATTACHMENTS • TECHNI-TAPS and DIES • ROTARY FILES
FLEXIBLE SHAFTS and MACHINES • QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

Now in the 3 hp range.. **FOUR NEW MACHINES FEATURING**



Camera study of good management at work! The job — form mill two radii on medium steel wedge plates. Fine finish required. With new Kearney & Trecker 3 hp Model 24-AC machine, operator sets up automatic table

cycle for reciprocal milling and easily paces production using climb and conventional milling alternately. **RESULT:** 28% savings in loading time, reduced scrap, more uniformity, less operator fatigue.

KNEE-TYPE MILLING MONO-LEVER CONTROL

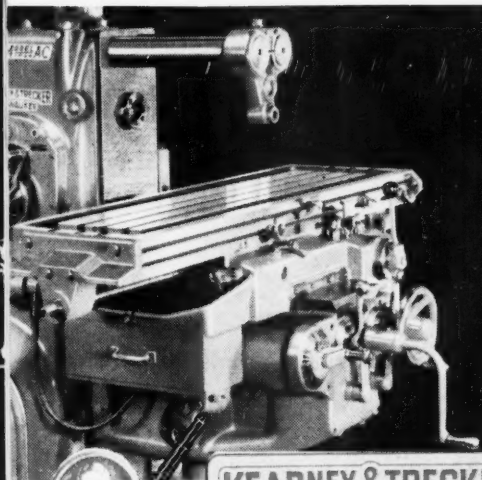
YOU asked for them — Kearney & Trecker milling machines in the 3 hp range with Mono-Lever Control and Automatic Table Cycle. Here they are — your choice of two different styles, plain or vertical with either 18" or 24" table feed.

These machines offer you features never before available on machines of this size and type: 33% larger table working area plus built-in deep-well coolant troughs all around — extra large (2" dia.) precision-ground table screw with adjustable nut to eliminate backlash — drawer-type chip containers for easy chip removal — positive metered lubrication of the saddle and table ways and table feed mechanism — six-way power rapid traverse — automatic spindle stop — and quick-change feed and speed selection.

Don't wait. It costs you nothing to find out today about these new machines. See how they can meet all around big or small job requirements in your shop. For detailed information call our nearest representative or write direct to Kearney & Trecker Corporation, 6784 West National Ave., Milwaukee 14, Wis.

You get 33% more table working area on these new machines — 38" x 14" on Model 18-AC and 44" x 14" on Model 24-AC. This means greater adaptability to handle more jobs.

New 3 hp Model 24-AC plain style Kearney & Trecker milling machine featuring Mono-Lever Control and Automatic Table Cycle . . . ask about it or the vertical style equivalent today!



KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

SHELDON

Big Shaper Performance Small Shaper Price

The SHELDON 12" Back-Geared Shaper is neither too big, nor too small. It is just right for most shaper work in most tool rooms and shops.

In weight, design features, capacity and performance, it is a "big shaper." In price, operating cost and floor space, it resembles a "small shaper." It is the logical first shaper for the small shop and installations in large plants.

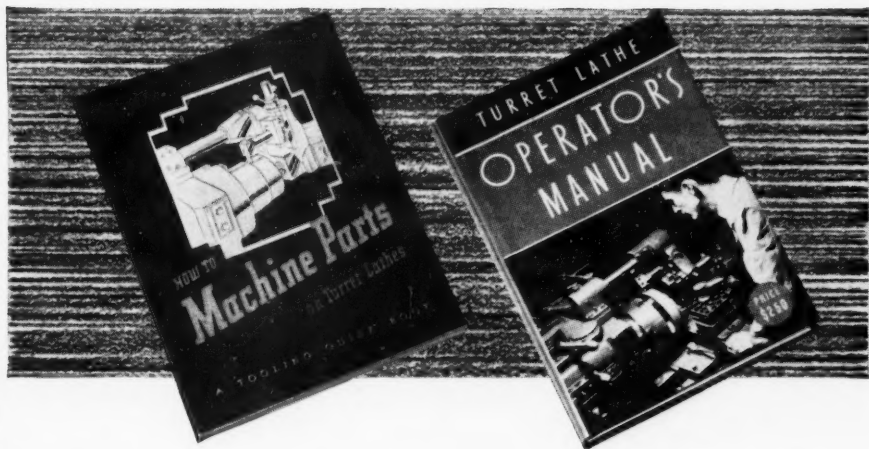


Write for Shaper Circular that shows, describes, and gives specifications of this shaper and its available accessories.

**SHELDON
No. 8000
12" Back-Geared
SHAPER**

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers
4250 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.



HELP YOUR OPERATORS BECOME WORTH MORE *to Themselves and to You!*

Here are two great books on turret lathes, tooling setups and methods published by the Warner & Swasey Company—in the

interest of better turret lathe operation. Many companies have found it profitable to provide them to each operator.

SOLD AT FAR BELOW ACTUAL COST!

OPERATOR'S MANUAL — 240 pages and over 350 illustrations, on all phases of turret lathe setup and operation, speeds and feeds, methods and shortcuts, tool angles and threads, etc. Eliminate guesswork in setup—*only \$1.00*, plus your state sales tax.

TOOLING GUIDE BOOK — This 64-page book breaks down the most complicated setup into its simplest elements and shows how to plan tooling for combined and multiple cuts. All types of bar and chucking work on turret lathes is carefully explained. *Only 50¢*, plus your state sales tax.

SEND THIS COUPON TODAY!



Department 320

Warner & Swasey Company, Cleveland 3, Ohio

Please send "Operator's Manuals" @ \$1.00 and
"Tooling Guides" @ 50¢ plus my state sales tax. Enclosed
is \$

Name

Address

City Zone State

M-11-49

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for
Polishing**




ALUNDUM Polishing Abrasive is available in a wide range of sizes and with special surface treatments to meet the exact requirements of every polishing job. For helpful polishing tips and for full details on cost-cutting ALUNDUM abrasive see your Norton distributor—or write for a free copy of "Setting-up Metal Polishing Wheels and Belts."

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with ALUNDUM Abrasive!

Right
for
Tumbling



ALUNDUM Tumbling Abrasive is an ideal tumbling medium because—
it's **all abrasive** for a continuous cutting action—it's **heavy** for the fast,
positive cut—it's **hard and tough** for a long productive life. Contact your
Norton distributor for full details, or write for "Precision Tumbling with
ALUNDUM Abrasive."

NORTON ABRASIVES

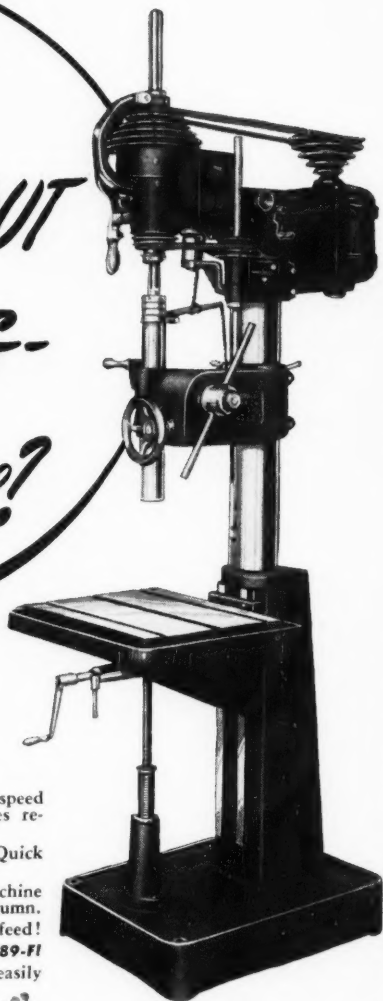
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*Want
MORE TURNOUT
in the BIG-
Hole Range?*

The "Buffalo" No. 22

IS THE DRILL FOR YOU!

- Convenient adjustments slash setup time. 8 quick speed changes! Handy table-raising screw! No wrenches required!
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 - 2" capacity in cast iron—a big, accurate rigid machine 97" high with 1.312" spindle and 5.15" steel column.
 - Single or multispindle models! Sensitive or power feed!
- WANT ALL THE FACTS? WRITE FOR BULLETIN 2989-FI**
Gives complete data on this big drill that handles as easily as a small drill—for economy on the big holes!



BUFFALO FORGE COMPANY

388 Broadway

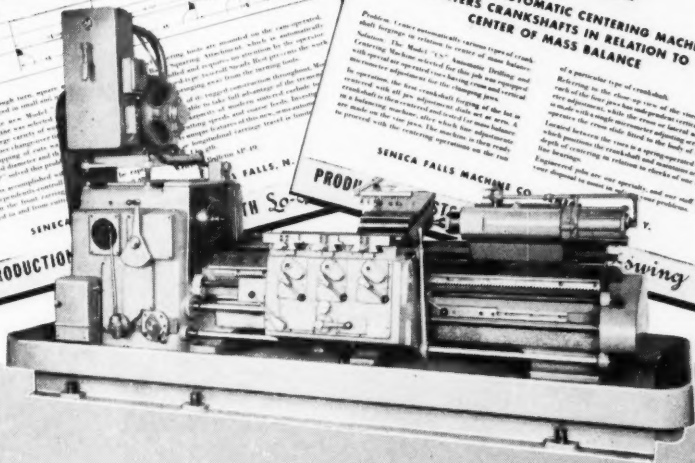
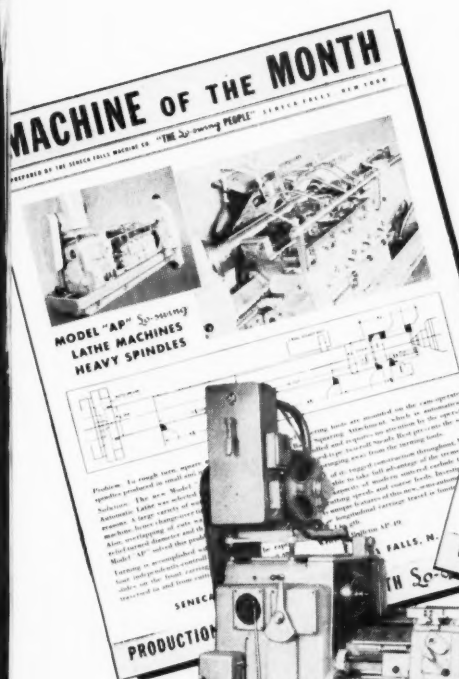
Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

HOW DO YOU MEASURE OBSOLESCENCE?

Never lose sight of the fact that your cost must be as low as your competitor's if you expect to stay in business.



Age, by itself, is only a fair measuring stick for obsolescence. A machine tool is obsolete, when replacement by a new machine, offering production economies, will pay a substantial dividend on the net investment. Many relatively new machines are now obsolete because more efficient ones have been developed that will outproduce them at lower cost. In the last six months Seneca Falls has announced new machines which, in specific cases, are paying for themselves out of savings over methods which were *efficient* 12 months ago. ● Seneca Falls Machine Co., Seneca Falls, N. Y.

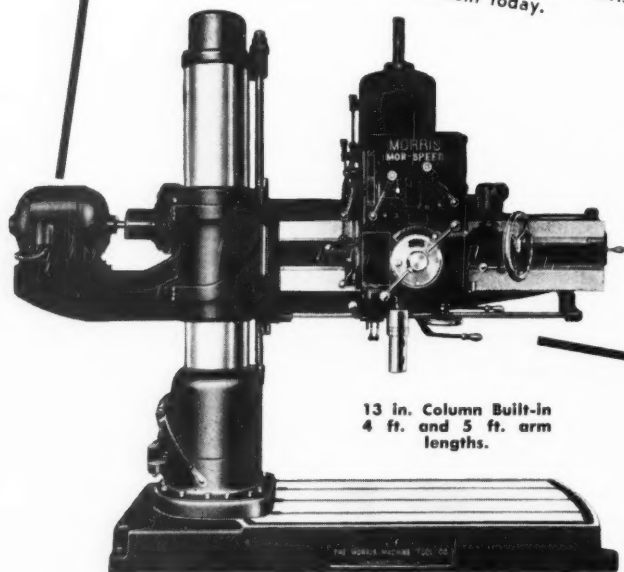
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MOST PROFITABLE DRILL INVESTMENT TODAY

Morris builds a radial of rigid construction. The base is a deep box section, well ribbed and provided with T slots. The column and sleeve are also of heavy design, ribbed for their entire length. The sleeve is mounted on the inner column with specially designed deep groove ball bearings. The arm is a deep box section ribbed with a double wall section of metal the entire length.

Among other features it has all speed and feed change levers within easy reach of operator. Its index plates are direct reading. Its dial depth gauge is graduated and has a direct reading plate for setting drills to compensate for drill points.

Write for complete details and learn why Morris Radials are the most profitable drill investment today.



13 in. Column Built-in
4 ft. and 5 ft. arm
lengths.



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CINCINNATI 3, OHIO

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Performance

SMALL MACHINE COST!

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SURFACE
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Cut Production Costs on small Precision Parts with Atlas 10" Lathes

Handle the work
big lathes can't
do economically



The low-priced Atlas "Quick-Change" 10" Lathe is tops in the shop—for precision work and economy. With 10" swing ($6\frac{5}{8}$ " over carriage), 24" and 36" between centers, and 16 spindle speeds from 28 to 2072 RPM, it has the capacity for most small parts operations—and it's much cheaper to run than bigger lathes.

Instant selection of 54 threads and feeds saves set-up time, speeds production. And with its heavy, massive construction, precision-ground ways, and Timken Tapered Roller Bearings, the Atlas is an accurate, smooth-operating

lathe that is ideal for both 'round-the-clock production and tool room use.

Atlas standard 10" lathes start at \$212.00 F.O.B., Kalamazoo—"Quick-Change" at \$272.00. Send for latest catalog with complete facts.

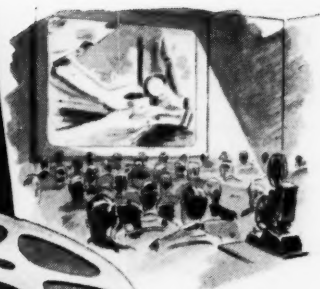
ATLAS PRESS CO.

1146 N. Pitcher St., Kalamazoo, Mich.



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Another Contribution To Better
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**WORLD'S GREATEST
TOOLMAKERS**



Educational, Instructive, Entertaining

A "MUST" FOR YOUR TRAINING PROGRAM

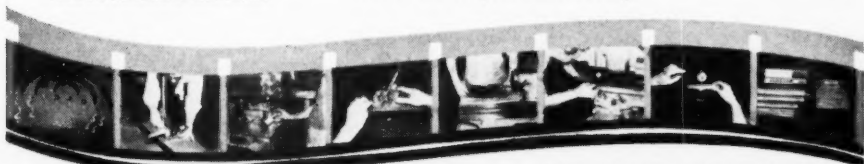
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"THE TOOLS AND RULES FOR PRECISION MEASURING"

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- Highlights in the history of precision measuring
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- Uses only 2 work fixtures.
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- Gives reliable, consistent results on a wide range of work.

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TOOL GRINDERS—FACE MILL
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NEW Kalamazoo

METAL CUTTING BAND SAW



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\$245⁰⁰

F.O.B. WITH MOTOR

★ **UNOBSTRUCTED VIEW
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★ **6" x 10" CAPACITY**

★ **4 CUTTING SPEEDS**

★ **½ MINUTE BLADE
CHANGES**

★ **CONSTANT, CONTROLLED
PRESSURE ON CUTS**

The new Kalamazoo Metal Cutting Band Saw No. 610-S is today's outstanding tool value! It combines many new exclusive features with rugged construction for exceptional sawing service.

It cuts angles, bars, tubes, pipe up to 6" x 10". *Four* speeds (53 to 266 FPM) provide wider choice in matching cutting speed to material.

A unique dash-pot mechanism insures constant, controlled pres-

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The 610-S has 4 legs for greater stability, weighs 198 lbs. for complete portability. Uses any standard motor (⅓ HP 110/60/1).

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KRW ANNOUNCES

A NEW, LOW-COST HYDRAULIC BROACHING MACHINE FOR "PUSH-PULL" OPERATION

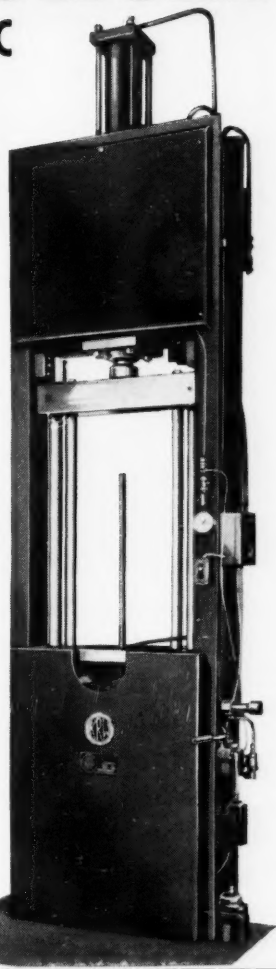
VERTICAL OR HORIZONTAL MODELS...25,
50, 60-TON CAPACITIES, UP TO 48" STROKE

You have to see this new KRW Broaching Machine in operation to appreciate its many features not the least of which is initial cost. This broaching machine will handle any work within its stroke and working capacity. In a matter of seconds, it can be changed from "Push" to "Pull" operation. It can also be used as a press. Pressures and stroke are infinitely variable within rated capacity. Electrical controls are standard. Available in either vertical or horizontal models. Choice of Ten different hydraulic pump combinations. Write for detailed literature, specifications and prices of standard models. Use the coupon.



The KRW Broaching Machine being used as a hydraulic press. In many plants this feature is a definite plus value.

All controls within convenient reach of the operator. Pressure gauge at eye level. Manually operated four-way valve permits instant and precise finger-tip control of ram. Every control readily accessible.



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K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

Please send information on KRW Hydraulic Broaching Machine. Capacity Req. 25 Ton ☐ 50 Ton ☐ 60 Ton ☐

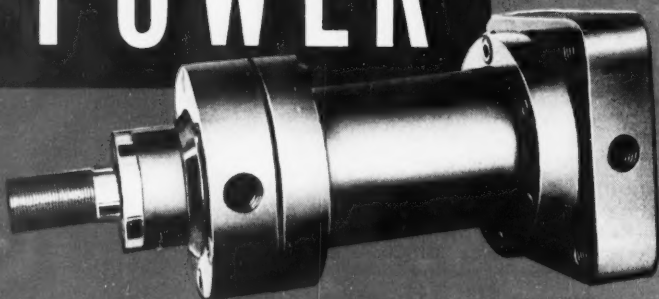
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Lindberg Air & Hydraulic Cylinders are available in a complete range of mountings—with any length of stroke.

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LINDBERG AIR & HYDRAULIC **CYLINDERS**

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MARVEL High-Speed-Edge Blades assure Faster, more Accurate cutting with proven Economy and complete Safety. Only the MARVEL is a composite blade with a high speed steel cutting edge electrically welded to an exceptionally tough, strong alloy steel body.

The High-Speed-Edge does the cutting while the alloy back with hardened eyes, carries the load. Blade tensions up to 300% higher than those possible with ordinary blades are recommended. This greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MARVEL design feature) and cannot be overcome by work resistance. Heavier feeds and greater speeds are practical without "run out."

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Ask your local MARVEL distributor (see classified phone book) to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary high speed steel blades.



1. High Speed Steel cutting edge.

2. Tough unbreakable alloy steel body with hardened eyes.

1. & 2. Integrally welded to make a fast-cutting, long lasting composite blade that is positively unbreakable.

ARMSTRONG-BLUM MFG. COMPANY

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE

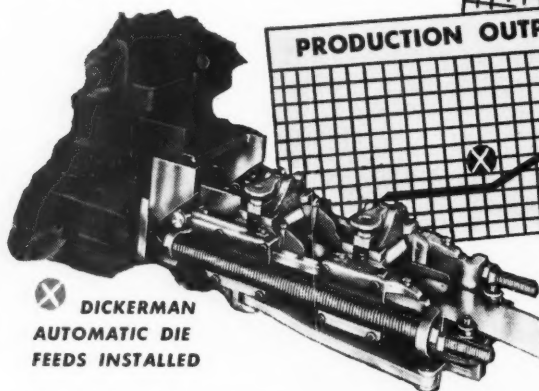
CHICAGO 39, ILLINOIS



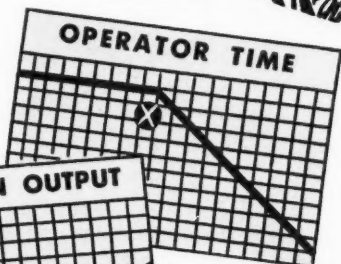
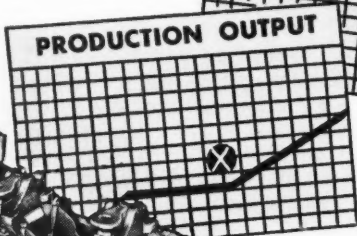
WITH DICKERMAN DIE FEEDS . . .

*You Can
Reduce Operator
Time by 90%*

WE'VE
DONE THE
JOB IN
ONLY
1/10th
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STEPPED-UP
3 TIMES



Add to this production phenomena, the FACT that the cost of DICKERMAN DIE FEEDS is so LOW they PAY FOR THEMSELVES the first month of operation.

PRODUCTION INCREASES up to 300%

Completely automatic and exceptionally accurate, these improved Feeds will handle Brass, Steel, Copper, Paper, etc., from any position on the press and REDUCE OPERATOR'S TIME BY 90%.

Ruggedly constructed, DICKERMAN DIE FEEDS, are made in many styles and sizes, can be easily installed on ANY punch press.

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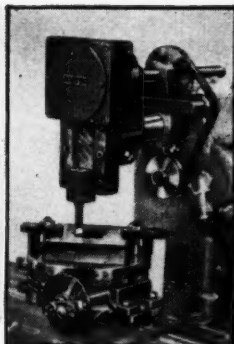
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Increase the Versatility
of Your Bench Mills

400%

with the

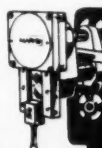
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AND ROTARY TABLE**



"Vin... Look... It's New! A sturdy slotter for your bench mills."



"Gee—and simple, too—no motor needed—attaches quickly, right to the spindle."



"Pull it out past the travel of the table for overhangin' work—Set it at angles to get draft in dies, for instance."



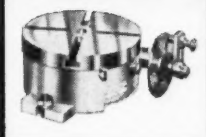
"And so-o-o quiet and smooth, it's a honey to operate. Uses the automatic feed of your present bench mill."



"Look at the awkward jobs it simplifies—dies like this, squared holes, splines, gear teeth, and such like."



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Add this MARVIN Rotary Index Table to your Slotting Attachment for maximum versatility. This 6" table cannot be matched for price—extremely rigid, furnished with index plates and hand wheel.

MARVIN R-1102 \$93.00
ROTARY TABLE F.O.B. Factory

This MARVIN Slotting Attachment makes your bench mill capable of a wider range of work than you thought possible—gives you an extra machine tool, (quick job change-overs), without a big investment. Mail the coupon today for literature and prices on the full MARVIN line of Bench Mill Attachments, including Vertical Mill Attachment and Rotary Table.

MARVIN 5-1070
SLOTTING ATTACHMENT

\$82.00

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This manufacturer was grinding hardened and soft steel stock on a Mattison surface grinder to a required finish of 15 micro-inches. With a conventional grinding wheel, it took one hour and 30 minutes to do all four sides. When he switched to a 20" x 6" x 10" WA 362-IVC Robertson Wheel, this time was reduced to 45 minutes. Stock removal averaged .030" to .035". Table speed was reduced to 40 feet per minute and cross feed to the lowest position.

In addition, the Robertson Wheel required less truing than the conventional wheel and did its job with little or no wear.



This manufacturer increased his productivity 100 percent . . . and did it at lessened wheel costs!

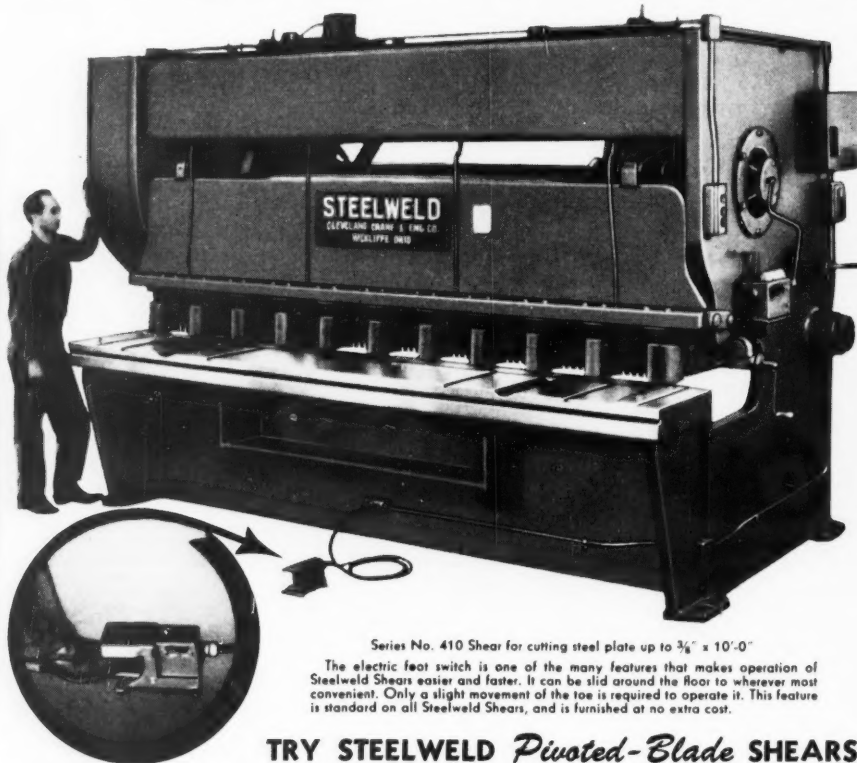
Results like these are not rare, but are being achieved daily with Robertson Wheels in machine shops all over the country. It will pay you to find out how much more, and better, work Robertson Cool-Cut Wheels can do for you. Send for your free copy of the interesting pocket booklet "How to Buy Production Time."

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Series No. 410 Shear for cutting steel plate up to $\frac{3}{4}$ " x 10'-0"

The electric foot switch is one of the many features that makes operation of Steelweld Shears easier and faster. It can be slid around the floor to wherever most convenient. Only a slight movement of the toe is required to operate it. This feature is standard on all Steelweld Shears, and is furnished at no extra cost.

TRY STEELWELD *Pivoted-Blade* SHEARS

REGARDLESS of what shears you have ever operated, in Steelweld Pivoted-Blade Shears a new thrill is in store for you.

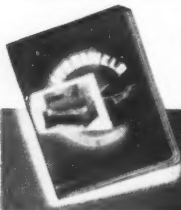
Like a modern streamlined engine as compared to an old-time locomotive, or a luxury liner versus a tramp freighter, so will you find these new shears as compared to all power shears you have ever used before.

Here at last is something new in shearing history a great advancement in design and performance

the only truly basic change for many decades.

Not only are these new shears easier to operate but their design assures smooth straight cuts to hair-line accuracy for years of operation. Their construction is extra heavy and all modern features are incorporated to provide for ease of operation, minimum maintenance and long life.

If you shear plate in any thickness to $1\frac{1}{4}$ -inch or length to 18 feet, you should get the facts on these new Steelweld Shears. Send for catalog today.



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CATALOG No. 3011 gives construction and engineering details. Profusely illustrated.

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Here is the smallest, most powerful and highest quality 1/4" standard duty portable electric drill ever built! All the features of Thor's amazing *Silver Line*—gleaming

die-cast housings, all ball bearing, Heli-Coil thread inserts, etc. Available in seven drilling speeds. Write today for *Silver Line* Catalog E-2, or see your Thor distributor.

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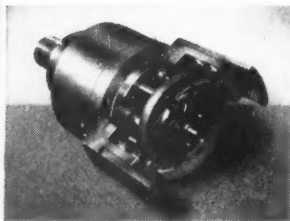
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TOOLS

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The costs to machine this brass pump housing aren't excessive (simply spot drilling, boring, facing, chamfering) — until it comes to drilling the 4 holes in the flanges. There's the rub: *extra* handling . . . and *extra* costs. P&J Tooling on the P&J Automatic solves the cost problem with tungsten carbide tooling, and . . .



THE P&J-DESIGNED SELF DRIVEN MULTIPLE SPINDLE DRILLING ATTACHMENT which is automatically indexed into exact alignment — to drill and c'sink the 4 holes in one operation while the work spindle revolves. Machining time is reduced . . . unnecessary work-handling eliminated. Good points to remember!

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P&J AUTOMATICS



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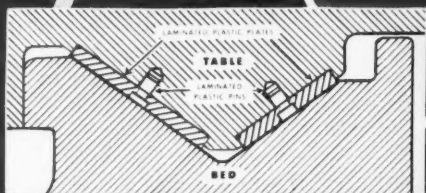
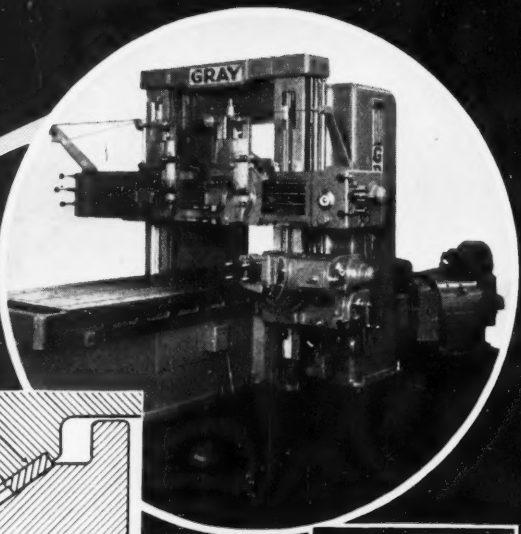


ROTO-CLONE is an exclusive product of American Air Filter Company, Inc., Louisville, Kentucky, representing a complete line of dust collector designs widely used in every dust-producing industry.

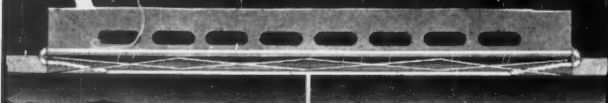
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3

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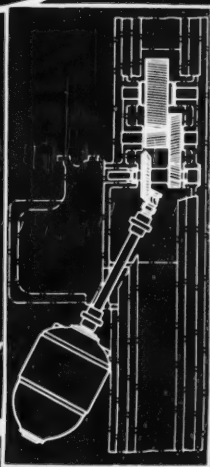


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PLANERS - MILLING MACHINES - HORIZONTAL BORING MACHINES

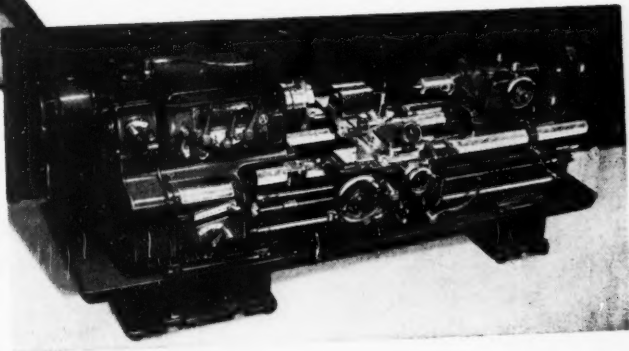
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MANAGEMENT EXECUTIVES AGREE a greater volume of production per man-hour and better quality work at less unit cost are produced in their machine shops on AXELSON heavy-duty engine lathes.

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LONGER LIFE — LESS MAINTENANCE with AXELSON lathes, cut depreciation and plant overhead...provide years of added precision work without usual replacement costs.



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WHICH GAGE WILL YOU BUY?



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**HIGH SPEED
VK CARBOLOY**

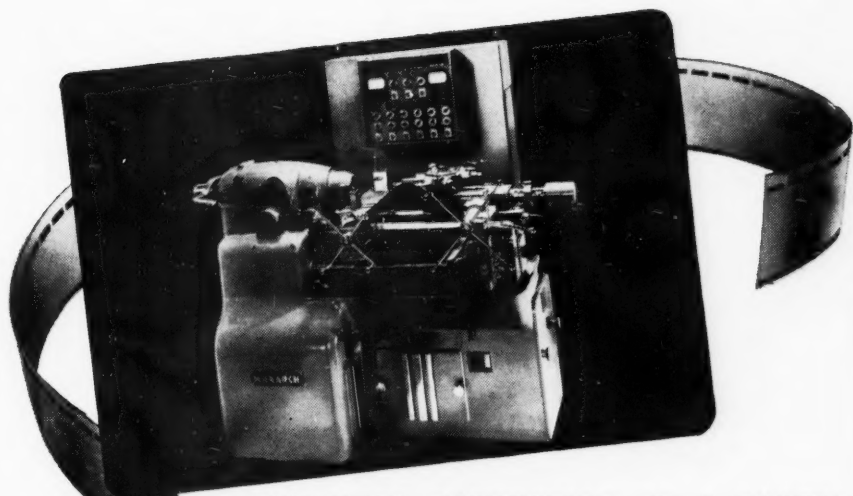
FOR SUPERSERVICE Phone Watertown 4-4394

THE *Van Keuren*
CO.,

30th Year

175 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks •
Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires •
Thread Measuring Wires • Gear Measuring System • Shop Triangles •
Carboloy Plug Gages • Carboloy Measuring Wires



FOR PEAK PRODUCTION AT A PROFIT invest a few minutes in *THIS FREE FILM*

THE
SPEEDI-MATIC
A 23 MINUTE
SOUND MOTION PICTURE
(16 MM.)

PRESENTED BY
**THE MONARCH
MACHINE TOOL CO.**
SIDNEY, OHIO

"World's Fastest Hand Screw Machine"—that's what metal turning experts, everywhere, are calling the Monarch *Speedi-Matic*. It operates so fast, so accurately you have to see it to appreciate it.

Because you may not be able to spare the time for a trip to Sidney to see the *Speedi-Matic* demonstrated in our own showrooms, we've put its operation on film, ready to perform for you in your own office or assembly hall.

To secure the loan of a free print of this interesting and valuable new film, fill in the coupon below and mail to us, attached to your letterhead. Be sure to supply all requested information. That will help insure definite reservation for use at a time suitable to you.



The Monarch Machine Tool Co. • Sidney, Ohio

Please book your twenty-three minute, 16 mm. sound film, "The Monarch *Speedi-Matic*", for use on

Showing Date _____ Alternate Date _____

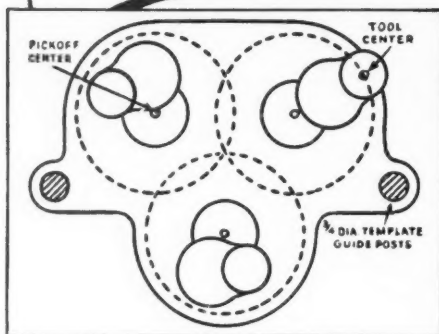
Organization _____

My Name _____

Street Address _____

City _____ State _____

CUT YOUR COSTS
with
Multiple Drilling, Tapping,
and Boring
Use **WISCONSIN**
Kwick-Change Multiple
Adjustable **DRILL HEADS**

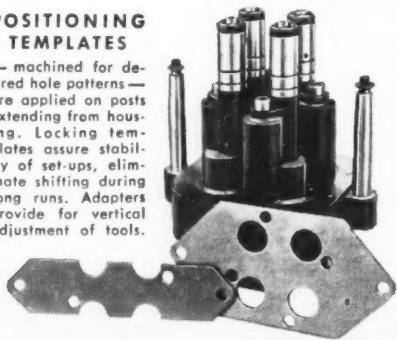


◀ ***This is Why!***

Only WISCONSIN Kwick-Change Multiple heads permit locating drill point anywhere within area of intersecting circles. There are no "blind spots" inside these circles. Spindle housings are sleeved with two centers of adjustment. Each spindle swings around one center which also may be rotated around another center. Diagram at left shows how this feature permits tool point to be located at any point within area of large circle.

**POSITIONING
TEMPLATES**

— machined for desired hole patterns — are applied on posts extending from housing. Locking templates assure stability of set-ups, eliminate shifting during long runs. Adapters provide for vertical adjustment of tools.



WISCONSIN Kwick-Change Multiple Adjustable Drill Heads are available with two to eight spindles, and in a complete range of capacities from "Light Duty" to "Extra Heavy Duty", in standard models. Heads with more than eight spindles built to special order. Positioning and Locking Templates are specially machined for as many hole patterns as required.

Write for Literature and Data Sheets.

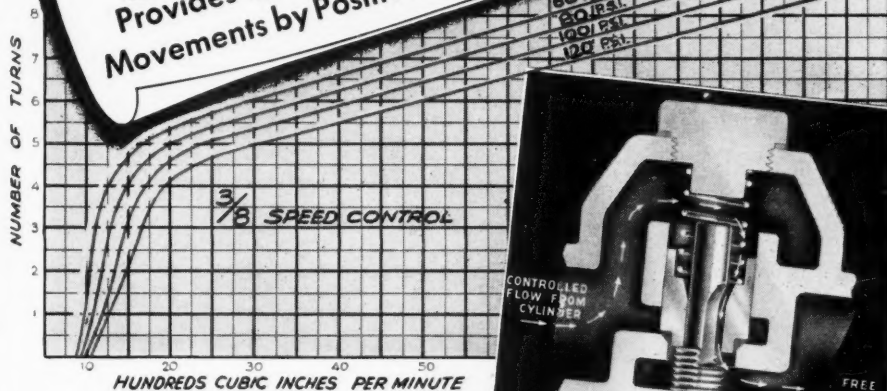
WISCONSIN DRILL HEAD CO.

Sole Representatives
in Principal Cities.

BUTLER, WISCONSIN

ROSS Speed Control VALVE

Provides Split-Second Timing of Piston
Movements by Positive Control of Air Flow



Available in sizes $\frac{1}{4}$ " through $1\frac{1}{4}$ "

With air flow regulated by screw action, changes in volume take place with constant progression—not a series of "steps"—but with micrometer accuracy. Control of the air flow is absolute—from zero to maximum.

Simple—dependable—rugged. Only two moving parts—stem and poppet.

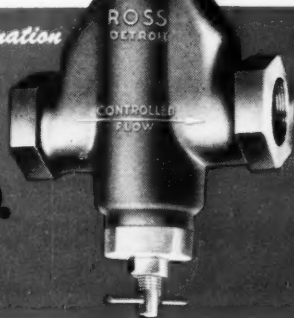


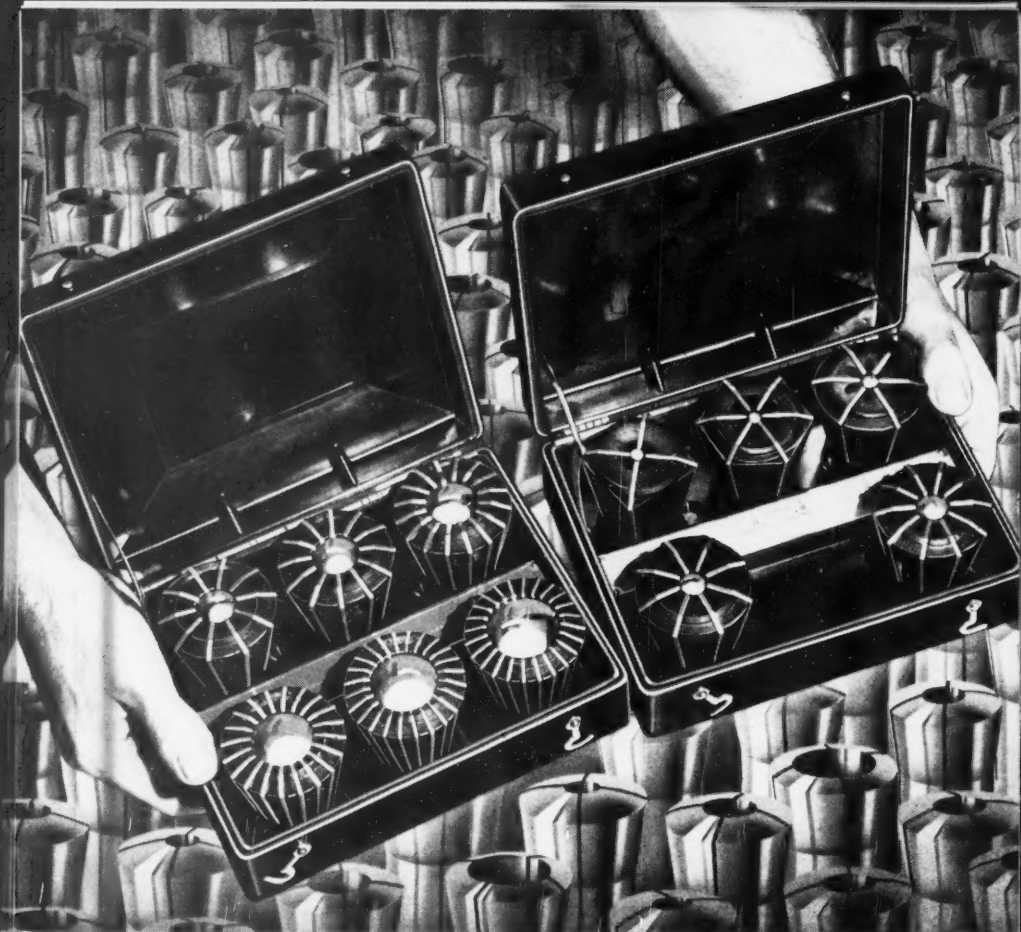
Ask Ross for Any Air Control Information

ROSS
Air Control
VALVES

ROSS
Operating
VALVE CO.

120 E. Golden Gate Ave.
DETROIT 3, MICHIGAN





SO FEW DO SO MUCH! The full set of eleven Jacobs Rubber-Flex Collets fits into two moisture-proof plastic boxes, each

only 6 x 9 x 3"! They chuck any bar from $\frac{1}{16}$ " to $1\frac{1}{2}$ ". You'd need 88 steel collets to cover the same range in 64ths.

THESE 11 COLLETS DO THE WORK OF 88

Revolutionary new collet design brings you unique performance

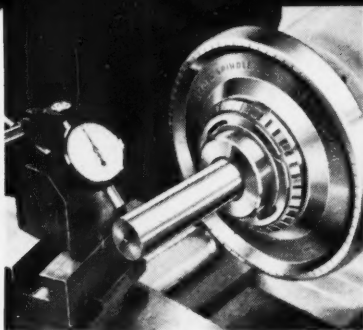
Each of these remarkable Jacobs Collets has a capacity of $\frac{1}{8}$ "...with accuracy and gripping power constant throughout! No more need to stock up on collets by $\frac{1}{16}$ ", $\frac{1}{32}$ ", $\frac{1}{64}$ ", and special decimal and metric sizes. No more costly storing, maintenance.

The hardened and ground steel jaws of the collets are bonded and mechanically locked together with Hycar Synthetic Rubber which will not set

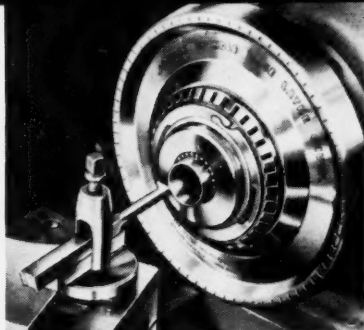
and which is not affected by heat, coolants, and cutting compounds. The jaws, being always parallel to the work, develop a gripping power of two to four times that of steel collets.

This chuck not only gives excellent performance when machining heavy cuts, but is equally outstanding when gripping thin shelled and fragile work.

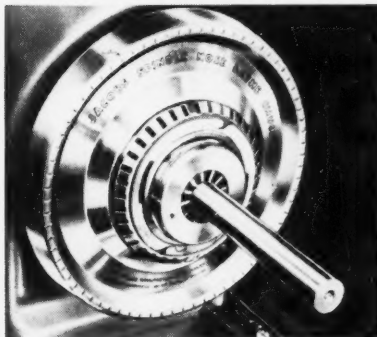
Write for bulletin 49-LC describing this new Lathe Collet Chuck.



UNPARALLELED ACCURACY — The most accurate Lathe Collet Chuck in the world today. The body is made from a single steel forging and is hardened and ground throughout. All internal and external surfaces of the collets are precision ground.

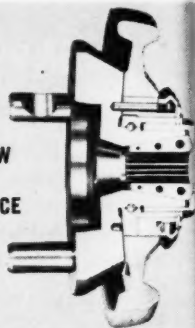


TWO TO FOUR TIMES THE GRIPPING POWER of split steel collets — *by actual test* — is yours with Jacobs Rubber-Flex Collets. Will not mar outer surface of the work as the gripping pressure is uniform over the entire length of bearing surface.



RUGGED CONSTRUCTION — With the exception of the solid aluminum Handwheel, all parts of the chuck are of hardened and ground alloy tool steel. Its compact design allows a saving of 1½"

**CUTAWAY VIEW
WITH
COLLET IN PLACE**



of overhang compared to present collet equipment. A unique impact tightening mechanism allows for very easy opening and closing of this chuck, thus reducing operator fatigue.



THE JACOBS RUBBER-FLEX COLLET

1. All external and internal surfaces precision ground.
2. The jaws in all collets have extremely long bearing surfaces in relation to the diameter.
3. Collet jaw bearing surfaces always parallel to and in full contact with work, assuring accuracy and gripping power.



The *Jacobs* SPINDLE NOSE LATHE CHUCK

THE JACOBS MANUFACTURING COMPANY, West Hartford 10, Connecticut

If it's a JACOBS . . . it holds!

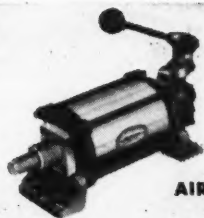
**These
Inexpensive Air
Powered Units Can
Double the Output
of Standard
Machine Tools**

PRODUCTION of such standard machines as drill presses, tapping machines, milling machines, etc., is frequently more than doubled by the use of inexpensive Bellows "Controlled-Air-Power" Devices.

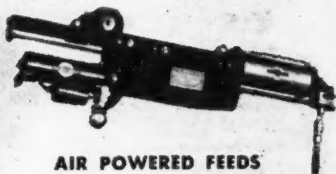
These small, compact, versatile power feeding and holding units replace manual feeding and clamping in a whole host of operations . . . make hand fed and hand clamped machines fast, automatic units . . . actually pay for themselves with the first few days of added production.

If you're looking for ways to make your operations more profitable, learn more about Bellows "Controlled-Air-Power" Devices.

*Write today for our new Foto Facts
File. The Bellows Co., 220 W. Market
St., Akron, O. Dept. MMS-1149.*



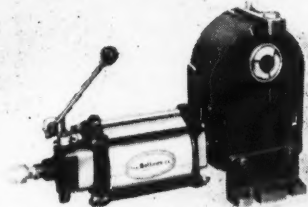
AIR MOTORS



AIR POWERED FEEDS



ROTARY FEED TABLES



COLLET CHUCKS

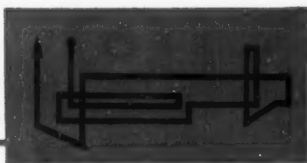


AIR POWERED VISES

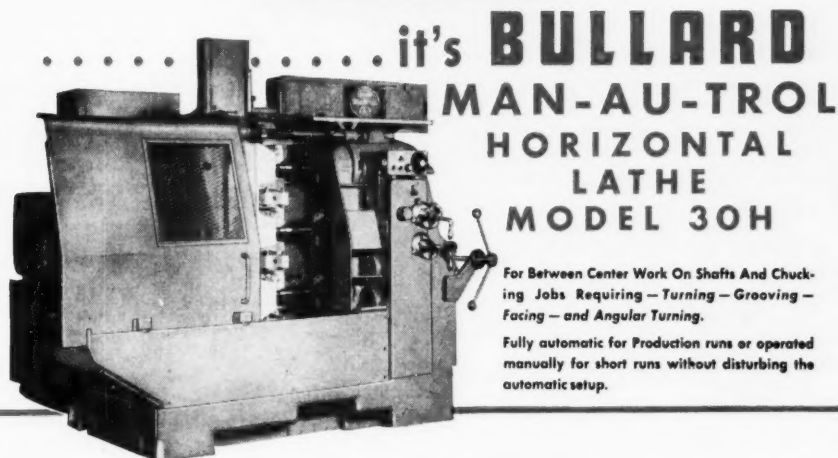
The Bellows Co.

AKRON, OHIO

Follow this



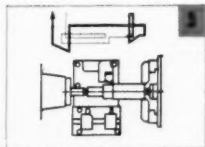
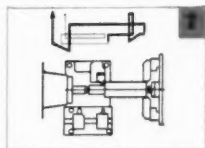
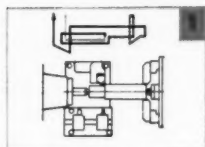
Tool Path



.....it's **BULLARD**
MAN-AU-TROL
HORIZONTAL
LATHE
MODEL 30H

For Between Center Work On Shafts And Chucking Jobs Requiring — Turning — Grooving — Facing — and Angular Turning.

Fully automatic for Production runs or operated manually for short runs without disturbing the automatic setup.

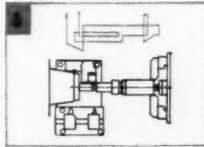
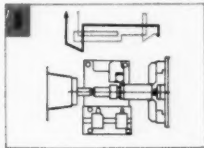
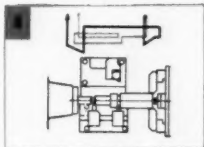


Man-Au-Trol has no predetermined sequence of operating functions, except when set for a given job. No cams are used for the movement of saddle or tool slide or for dwell at the end of a cut. Repetitive accuracy and uniformity of finished work is assured. ■ Drive pinion Shaft SAE 3250 Bar Stock steel (size 3" x 1 1/4") 1st. Oper. rough turn. ■ 2nd Oper. Finish turn to size. ■ 3rd Oper. finish turn to size. ■ 4th Oper. Lower tools groove and chamfer end. ■ 5th Oper. Upper tool enters groove generates 30 degree angle and finish turns to shoulder. ■ 6th Oper. finish face end of shaft. Production per hour 52 pieces.



16MM SOUND
MOTION PICTURE

Showing the setup and operation of the Bullard 30H Lathe is available for group showing. — When writing advise your preferred date.



THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT



HIGHER PRODUCTION?

Yes!

LOWER COSTS?

Yes!—and

ACCURACY BESIDES

with the

MOTCH & MERRYWEATHER

**NO. CIRCULAR
2-A SAWING
MACHINE**



Triple-Chip Method cut off 490 pieces in 50 seconds per cut at a cost of \$.0101 per piece.

**TRIPLE-CHIP
VS.
ALTERNATE METHOD**

(Sawing SAE 1020 5" O. D.)



Alternate method cut off 100 pieces in 235 seconds per cut at a cost of \$.0325 per piece.

As with all Motch & Merryweather Circular Sawing Machines, the No. 2-A (automatic) brings you all the advantages of the Triple Chip Method. Stock up to 6" is sawed accurately to length without burrs, giving a mill-type finish, which eliminates second operations. Work is held rigidly on both sides of the blade. With the M. & M. Triple Chip Saw Blade, correctly sharpened by the No. 1 Automatic Grinder, maximum cut-off speed and accuracy are attained. As us to furnish you with cutting time figures

★ ★ ★

The M. & M. No. 2-A Circular Sawing Machine has automatic, micrometer adjustable-stop bar feed to 36". Additional stroke lengths and conveyor can be furnished to accommodate long length bars.

• • •

A complete range of circular sawing machines is available for stock up to 16½" round as well as special machines to meet your requirements.

Write on your letterhead for Bulletin No. 2-D.

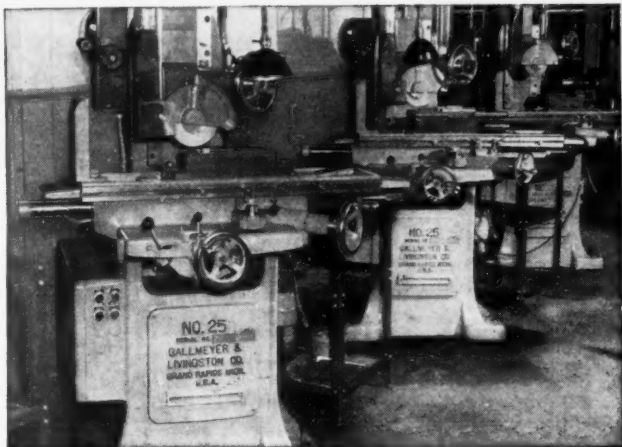
THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING CLEVELAND 13, OHIO

AT YOUR COMMAND • AN UNPARALLELED EXPERIENCE IN CIRCULAR SAWING

E

Enthusiastic Customers do our BEST advertising

In one of the world's largest electrical equipment plants, three of a battery of eight Grand Rapids No. 25 Hydraulic Feed Surface Grinders precision grinding lamination dies for motor stators.



You will appreciate the micro-inch finish produced at production speeds on Grand Rapids Grinders. All Grand Rapids Hydraulic Feed Surface Grinders have these outstanding features:

1. One-piece column and base casting for vibrationless rigidity
2. Precision ball-bearing spindle which is greased for life
3. Bijur one-shot lubrication system eliminating hand oiling
4. Patented vertical movement of wheel head for quick, accurate adjustments
5. Portable coolant tank for ease of coolant replacement
6. Vane type hydraulic pump for fast longitudinal table travel

to serve you—

Your inquiry concerning your specific grinding needs will receive prompt attention. Grand Rapids Grinders include: Hydraulic Feed Surface Grinders, Universal Cutter and Tool Grinders, Hand Feed Surface Grinders, Drill Grinders, Tap Grinders, and Combination Tap and Drill Grinders.

**GALLMEYER &
LIVINGSTON**
COMPANY

308 Straight, S. W., Grand Rapids 4, Mich.

GRAND RAPIDS GRINDERS

What is Meant by Scientific Tap Sharpening?

- Accurately spaced cutting edges
- Controlled rake angle
- Precisely ground flutes

The only equipment
on the market today
which will sharpen taps scientifically
is the
Blake Tap Sharpening Machinery.



437 Cherry Street, West Newton 65, Mass.

Black Diamond Precision Drill Grinders . . . Blake Tap Chamfer Grinders . . . Blake Flute Grinders . . . Waltham Cutter Sharpeners . . . Waltham Thread Milling Machines . . . American Tool Holders . . . Surface Finish Standards.

Sebastian GEARED HEAD LATHES

"For Many Jobs Formerly Done On
Much More Expensive
Equipment"

Sturdy
Construction

Advanced
Design

Top
Performance

D. O. JAMES

Manufacturers of *Gear Manufacturing Co.*
SPEED REDUCING TRANSMISSIONS CUT GEARS FLEXIBLE COUPLINGS

ADDRESS ALL CORRESPONDENCE TO
THE COMPANY NOT TO INDIVIDUALS

Mr. S. L. Beckwith, Sales Manager
American Steel Foundries
Tennessee Avenue & Paddock Road.,
Cincinnati 29, Ohio

1140 W. MONROE STREET
CHICAGO 7, ILL. U.S.A.
TELEPHONE CAVAL 6-1800
January 27, 1949.

Dear Mr. Beckwith:

We appreciate your interest, following the delivery of
our new Sebastian Lathe, in frankly asking us what we think of
this lathe.

We have many lathes in operation and have always
considered that we must have nothing but the heavy duty type
lathe as a matter of policy.

Since the delivery and installation of our new
16" x 6' Sebastian, we have found that so many jobs can be
done on it that we find ourselves thinking in terms of this
lathe for many jobs formerly done on much heavier and much
more expensive equipment.

For facing shoulders on hubs, turning a face angle
or back angle we find this Sebastian lathe more than adequate
and because of its sturdy construction it is capable of much
work up to its rated capacity.

We are giving serious consideration to additional
installations because of the satisfactory operation of this
first one.

Very truly yours,

D. O. JAMES GEAR MFG. COMPANY

By *John B. Lukey*
John B. Lukey,
General Superintendent.

JEL:SS

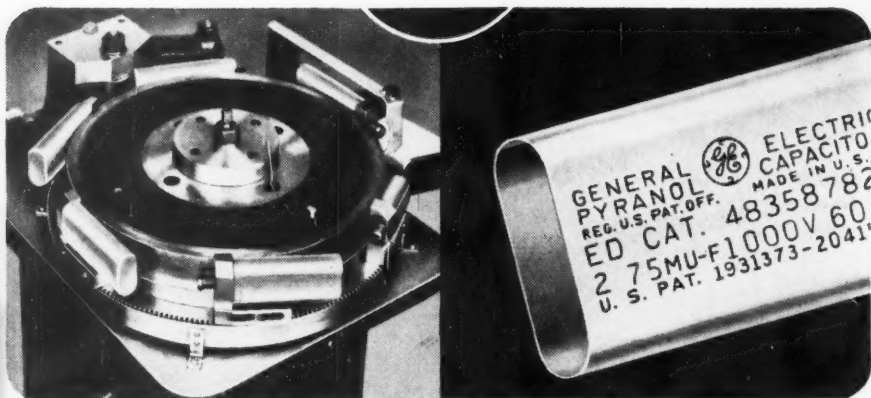
Write
for
Catalog
S-1
(Standard
Lathes)
and
S-101
(Special
Type
Lathes)

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of Vertical Boring & Turning Machines and Sebastian Lathes



• Noblewest Model 286 marking G.E. capacitors with large inscriptions shown at right

NOBLEWEST PRODUCTION MARKING MACHINES


*Save Time
Cut Costs*

Here's How: The marking operation is fast. There are no delays in the production schedule. Marking speeds are practically unlimited. Numbers and lettering are sharp, clearly readable because the inscription is permanently rolled in—identifying the product for life.

Whatever your problem, Noblewest will gladly help you save time and money in marking metal, plastics, and other materials. Catalog on request.

Write Noble & Westbrook Mfg. Co.,
25 Westbrook St., East Hartford 8, Conn.

MARK IT
BEST WITH



NOBLEWEST

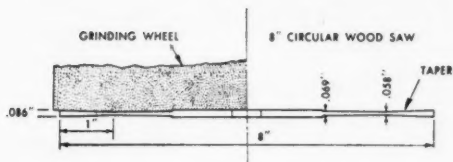
EQUIPMENT FOR MARKING • GRADUATING • EMBOSSING • NUMBERING

Adaptable New Thompson Surface Grinders

LOWER COSTS

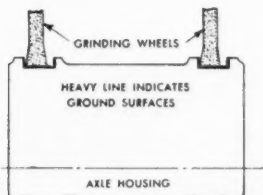
In a wider range of industrial applications

HERE'S
HOW



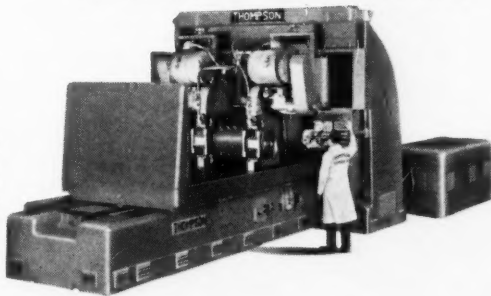
TRUFORMING MACHINE GRINDS CIRCULAR WOOD SAWS IN 300% LESS TIME

This Thompson Circular Saw Truforming Machine grinds 8 inch high carbon steel wood saws in 2½ minutes. Formerly this job required 2 operations and 8 to 10 minutes on a circular single chuck grinder. Machine is available in 6 to 12 inch and 6 to 16 inch sizes.



Thompson Hydrail Grinder (widest surface grinder built) reduces finishing time on massive diesel locomotive bearing housings and grinds to a tolerance of .0008" over 72" x 120" area. Machine illustrated is 72" x 36" x 120". In other industrial applications can sharpen large dies eliminating stripping down and assuring that all surfaces will be in correct relation. Horizontal or vertical wheel heads or both available. Write today for details or other information concerning possible application of Thompson Surface Grinders in your production work.

HYDRAIL GRINDER DOES 3-DAY JOB IN 2 HOURS ON LOCOMOTIVE BEARING HOUSINGS



► The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

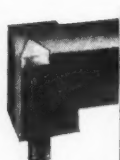
Thompson
SURFACE
Grinders

The Thompson Grinder Company, Springfield, Ohio

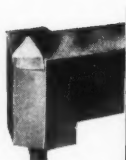
Copyright 1949—The Thompson Grinder Co. Dept. 13



Kennamatic Style RAR



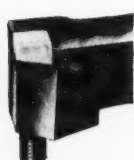
Kennamatic Style TAR



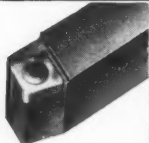
Kennamatic Style TBR



Kennamatic Style TFR



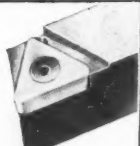
Kennamatic Style SBR



Kendex Style 11SKD



Kendex Style 3RKD



Kendex Style 3TKD



Kendex Style 11PKD



Planer Tool Style 11PH



Planer Tool Style 9PH



Planer Tool Style 59PM



Step Kennamill



"AF" Axial Face Kennamill



"CF" Face Kennamill

Here They Are

KENNAMETAL Developments in Mechanically-Held Tooling for Better Production at Less Cost

Kennametal mechanically-held tools are outstanding in their performance, and in the savings they effect, because:

THEY ELIMINATE THERMAL STRAINS

The inherent strength of Kennametal is more fully utilized. Harder grades can be used on heavy jobs at coarser feeds.

THEY SIMPLIFY TOOL SETTING

Tips can be repositioned, or replaced, without disturbing the tool holder.

THEY REDUCE GRINDING COSTS

Procedure is simpler and less frequently required. No steel needs to be ground—only the carbide. Indexing feature of Kennamatic and Kendex tools provides multiple cutting edges between regrinds.

THEY LOWER INVENTORY

Fewer tools are required to float a specific job, and only tips or inserts need to be stocked.

THEY INCREASE MACHINE PRODUCTIVITY

Down time is minimized because fewer tool changes and adjustments are required.

Our field representatives are fully equipped to help you apply this advanced tooling technique for better production at less cost. Ask them to demonstrate.

The tools illustrated are made in both hands, in various sizes, with Kennametal tips suitable for machining steel, cast iron, and non-ferrous alloys.

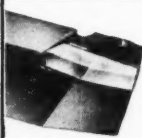
Send for Catalog 49

It shows the most complete
and diversified line of car-
bide tools ever offered.



KENNAMETAL Inc.

SUPERIOR CEMENTED CARBIDES
LATROBE, PA., U. S. A.



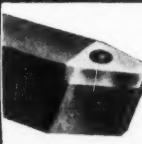
Clamped-on Style BLH



Clamped-on Style FLH



Clamped-on Style GLH



Grooving Tool Style SVG



"Universal" Face Kennamill

WHY LENOX HACKMASTER USERS ARE—

*Sitting
on top of
the World!*



ECONOMY

Do not break — no loss from breakage of partially worn blades.

DURABILITY

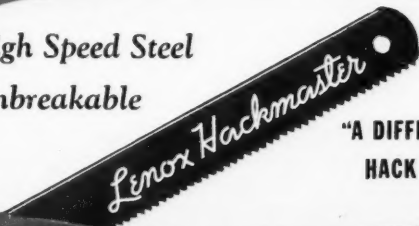
Made of High Speed Steel that will outlast several standard grade blades.

SAFETY

Will not shatter in use. No bruised hands or other accidents.

High Speed Steel

★ Unbreakable

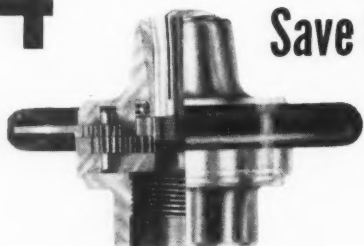


"A DIFFERENT HAND
HACK SAW BLADE"

AMERICAN SAW & MFG. COMPANY • SPRINGFIELD, MASSACHUSETTS

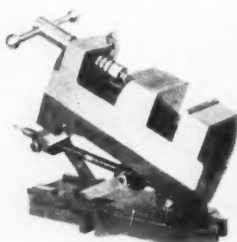
HACK SAWS • BAND SAWS • PLAT AROUND STOCK • TOOL BITS

4 Items To Reduce Costs, Save Operating Time



COLLET TYPE SPEED CHUCKS

- Increase capacity up to 40%, by elimination of draw table and sleeve inside.
- Eliminates use of wrenches and chuck keys as handwheel quickly opens and closes collets.
- Fits all lathes.
- Accuracy insured through precision collets in precision chucks.
- Five sizes from 1" to 3 1/2" collet capacity.
- From \$79. to \$250.

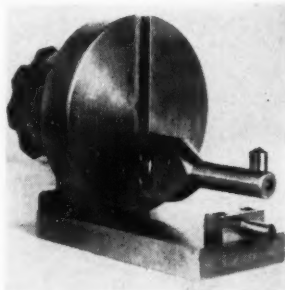


QUICK-LOK MACHINE TOOL VISES

- Available in 14 types and sizes from 3" to 9" opening, swivel plain or angle.
- Useful as a jig.
- Semi-steel castings hardened and ground parts.
- Rough and final adjustments easily executed.
- From \$16. to \$160.

EXPANDING MANDREL SETS

- One Expanding Mandrel takes the place of 12 or more plain arbors.
- Capacities from 3/8" to 5 1/2" diameter.
- Length of arbors from 4 1/2" to 18 1/4".
- Taper per foot from 1/2" to 1 1/8".
- 19 standard sizes.
- Sets from \$32. to \$79.
- Individual Mandrels from \$7.



RADIUS EMERY WHEEL DRESSER

- Designed to meet the demand for an inexpensive Radii Emery Dresser for concave or convex radius dressing.
- Capacity: 2 1/2" concave, 1 3/8" convex.
- Maximum wheel size 8".
- Overall dimension: 6" x 6" x 3".
- Price \$72. Available with built-in micrometer adjustment, \$150.

Prompt Delivery
Send for Complete Catalog

MONTGOMERY & CO., Inc.

Since 1876

55 PARK PLACE

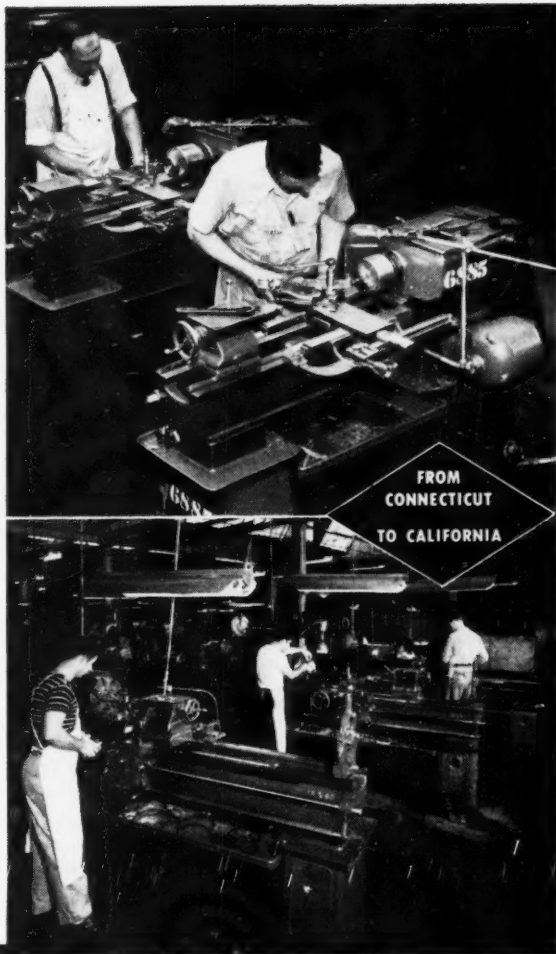
NEW YORK 7, N. Y.

(Right, above) Two 10" Tray-Top Cintilathes in use in the shop at Pratt & Whitney Aircraft, West Hartford, Conn.

(Right, below) Three Tray-Top Cintilathes in service at Wells Aircraft Parts Company, Los Angeles, Calif.

Wells Aircraft bought its first Tray-Top a year ago and after six months ordered two more. Mr. Elmer Wells writes:

" . . . Our work is of an experimental nature or short run jobs on aircraft which demand high grade finishes, close tolerances and trustworthy lathe alignments . . . We believe the **Ground Ways** are an important factor in producing accurate work . . . Our operators find the 1200 rpm and twelve speeds to be a decided advantage, particularly in changing from steel to aluminum parts of varying sizes and diameters . . . The enclosed **Quick Change Gear Box** is a good feature; it eliminates chips from clogging the gears."

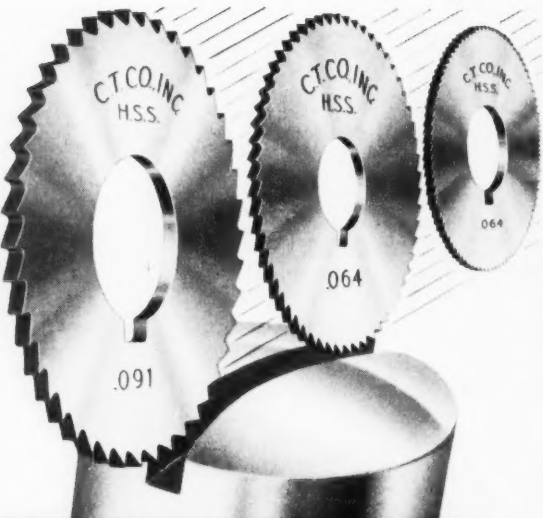


Swing Sizes: 10", 12½", 15", and 18". 15" and 18" sizes available with gap and gap block. Write for Bulletin T-100-2. Cincinnati Lathe & Tool Co., Cincinnati 9, Ohio.

20
TWENTY-FEATURE TRAY-TOP

cintilathe

*Right
in the
Groove!*



HIGH SPEED STEEL SCREW SLOTTING SAWS

by **CIRCLE**



*For complete listing
of these and other
Circle R products,
send for Catalog M,
just issued.*

Wherever screws are made you'll find Circle R screw slotting saws "in the groove" . . . performance proves there are no finer screw slotting saws than CIRCLE R!

Try high speed steel CIRCLE R SCREW SLOTTING SAWS . . . the test will tell you the rest!

Sizes: 1 $\frac{3}{4}$ " Di. — 90 Teeth

2 $\frac{1}{4}$ " Di. — 60 Teeth

2 $\frac{3}{4}$ " Di. — 72-56-44 and 36 Teeth

In various thicknesses and hole diameters,
carbon and High Speed Steel.

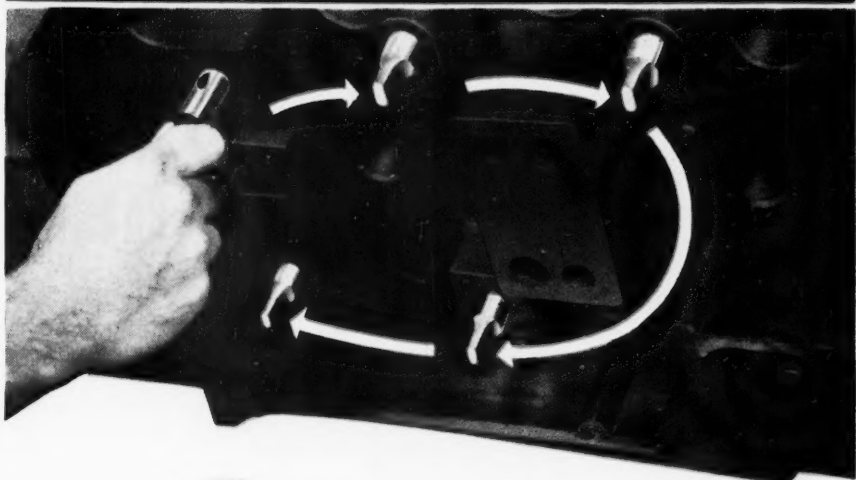


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PROVIDENCE 5, RHODE ISLAND


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LOS ANGELES • MILWAUKEE • MINNEAPOLIS • NEW YORK CITY
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It's **UNIFORMITY** that permits **INTERCHANGEABILITY**



in **PUNCHES and DIES**

Here's part of a die holding ten  punches, any one of which will interchange with the other nine or with any other  punch of like size . . . mating perfectly with the corresponding die. Such interchangeability, which cuts inventories and reduces die making costs, results from the complete uniformity of  punches and dies. They are made from selected steels with hardness controlled, and finished to the necessary close tolerances. Correct alignment is assured both vertically and radially.

 standard punches and dies are stocked for immediate delivery. Punches and dies of special sizes, shapes and materials are made promptly to your specifications.

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ALLIED PRODUCTS CORPORATION

Department 37

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Detroit 23, Michigan



**INTERNATIONAL
HARVESTER**
KEEPS
**MILLING MACHINES
PRODUCTIVE**
WITH
RUSNOK
MILL HEAD

MILWAUKEE WORKS; INTERNATIONAL HARVESTER CO. uses **RUSNOK Mill Head** as a vertical attachment on one of their milling machines. In this operation, it is milling a boss on the side of an International Harvester Diesel pump housing.

RUSNOK heavy duty Mill Head quickly and easily converts your horizontal mill to do vertical or angular milling, drilling and boring operations. **RUSNOK Milling Attachment** takes the place of costly, special equipment — uses no valuable space, just install on your present mill.

Write for name of nearest **RUSNOK Mill Head** dealer. Let him show you how the **RUSNOK Milling Attachment** can be an important part of all your milling operations.

A Few Choice Dealerships Are Still Available

HEAVY DUTY

RUSNOK

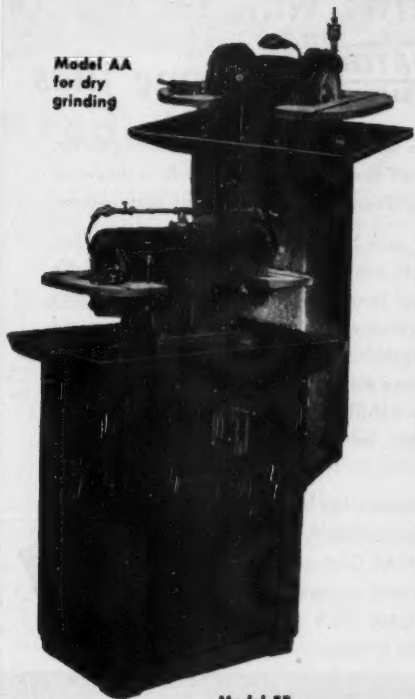
ATTACHMENT

MILLING • DRILLING • BORING

RUSNOK TOOL WORKS • 4840 W NORTH AVENUE • CHICAGO 39, ILL

GRIND TOOLS TO EXACT ANGLE .. **FASTER**

Model AA
for dry
grinding



Model EE
for grinding
wet or dry

PROSSER CARBIDE GRINDERS

YOU GET the grinding angle you want instantly with the famous indexing feature of these Prosser high-speed grinders. The quick-acting tables need never be raised or lowered—and once set, they stay put.

ECONOMICAL—You'll save time and you'll get more for your wheel dollar with a Prosser because wheels are easily adjusted to compensate for wear. Wheels can be used up practically 100%.

VERSATILE—Designed by the same Prosser engineers who introduced cemented carbide to American industry, today's Prosser Carbide Grinders are equally effective on stellite and high-speed steel.

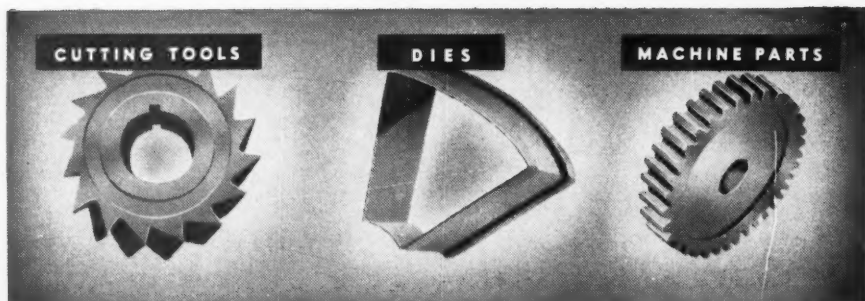
Before you get a grinder for rough work or fine finishing, wet or dry... get the facts on the Prosser. For details on bench and floor models, on chip-breaker, drill-grinding and other attachments... write for literature.

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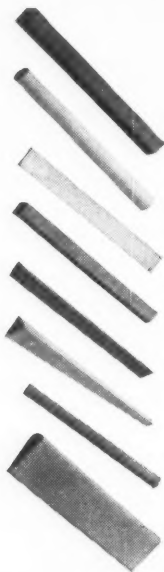
Established
1845

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THEY DO THEIR WORK BETTER WITH THE HELP OF

NORTON[®]
abrasives oilstone files



Here are the right tools to touch up a milling cutter, smooth off the burrs on a gear or fit a die—and *what a difference it makes in their performance!*

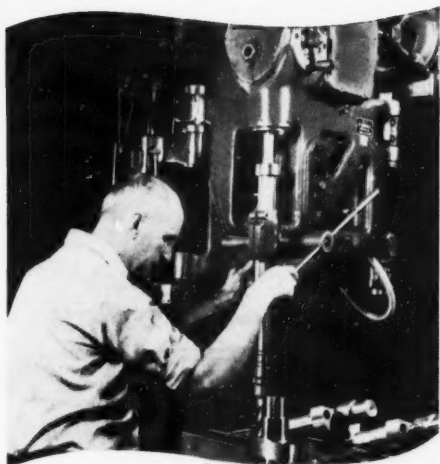
INDIA[®] and HARD ARKANSAS Oilstone Files, shaped to conform to work contours, and *all* file instead of rows of individual teeth, are the choice for this work among tool makers, die makers and master machinists. INDIA files of hard, sharp, electric-furnace aluminum oxide, are standard for general use. HARD ARKANSAS — a natural abrasive — is right for the finest jobs or the "finishing touches."

There are over two hundred different standard sizes and shapes of INDIA and HARD ARKANSAS Oilstone Files. Select the ones you need from the OILSTONE FILE BULLETIN. Write for it today.



BEHR-MANNING
TROY, N.Y.

ALSO MANUFACTURERS OF COATED ABRASIVES

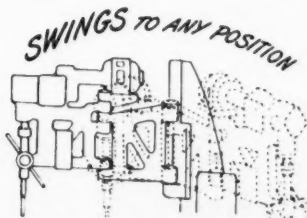


a radial drill that handles work **FAST**

Speed and ease of operation is the big feature of Footburt-Hammond Radial Drilling Machines. The unique hinged bracket construction makes it possible to swing the drill head quickly from hole to hole. And the wide range of speeds is instantly available to take care of small or large tools. Tapping reverse is electrically operated by means of a separate hand lever; no additional adjustments required when changing for drilling to tapping. In-the-line operations may be handled faster with the handy machine.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

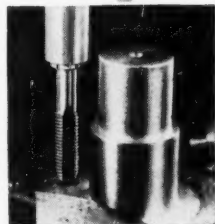
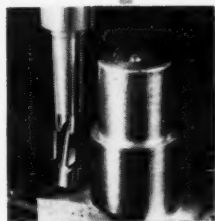
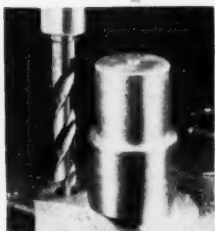
Detroit Office: General Motors Building

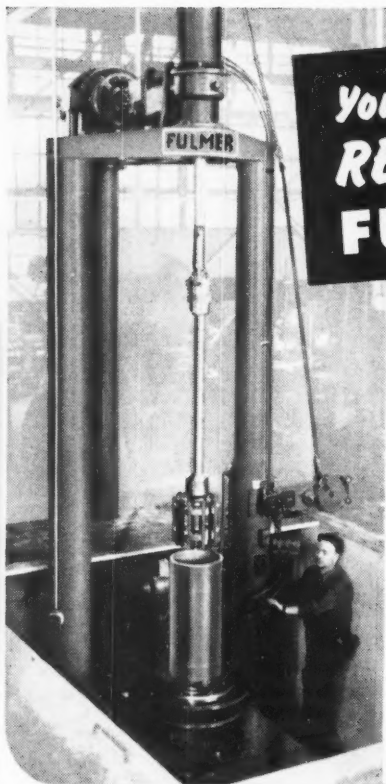


FOOTBURT-HAMMOND

A TIME TESTED LINE OF MACHINE TOOLS

radial
DRILLING MACHINES





Fulmer Model 20-72 honing large Diesel liner.

You Get **FAST STOCK REMOVAL** with **FULMER HONING MACHINES**

Read These Typical Production Examples:

1 NITRIDED STEEL AUTOMOTIVE CYLINDER LINER

3.06" bore x 6.43" length x .040" thick. .005" of stock is removed to $\pm .00025$ " tol. in less than 1½ minutes per piece.

2 GAS ENGINE CYLINDERS

11" bore x 30" length. .008"-.012" of stock is removed in 4 to 5 minutes.

3 FORGED GEAR PINION

Two 4.250" bores, in line, each 6" in length. .005" of stock is removed with surface finish of 10-12 micro-inches in 1 minute. Saved 90% on production time, improved finish 1000%, over previous reaming operation.

4 SEMI-STEEL DIESEL LINERS (Illustrated)

12¾" bore x 30¾" length. .006"-.008" of stock is removed in 5 minutes. Previous honing time was 2 hours!

Any internal cylindrical surface, ½" to 30" diam., can be finished faster, more accurately, at *less cost* by FULMER HONING. These machines offer the greatest value in the honing field. Investigate their advantages for your production. Write now for details and your copy of new 12-page honing bulletin.

Fulmer Company is sole U.S. distributor for the famous line of Alexander Ball Honing Tools. Now available in sizes from ½" to 50" diam. Write for complete information and prices.

C. ALLEN FULMER COMPANY

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New, Unique Simplicity!...

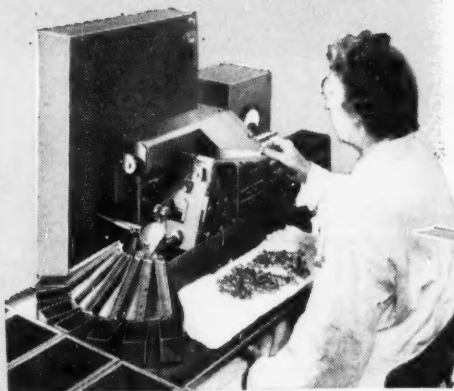
in custom-engineered

ELECTRONIC

INSPECTING

AND SORTING

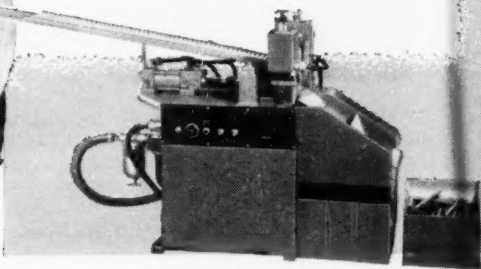
EQUIPMENT



▲
This single-motor, compact machine automatically gages and sorts anti-friction bearing rolls. It rejects rolls above or below mfg. tolerance and separates accepted rolls into 5 sized categories, in increments of .00002".

Through basic engineering developments, Brown & Sharpe is able to custom-build uniquely simple inspecting and sorting machines for precision parts. Machines of this description made by Brown & Sharpe have the advantages of simpler, sturdier construction; more stable adjustments; and easier manipulation of sensitivity.

Why not turn over your problem of getting machines like these to Brown & Sharpe? Learn what Brown & Sharpe can offer in custom-built inspecting and sorting machines, from manual loading and disposal to fully automatic. Send requirements outline to Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

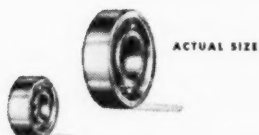


▲
This machine gages and sorts straight sleeves into four categories — measuring for length as well as diameter at both ends. Its production rate is approximately 3000 per hour.

BROWN & SHARPE



The
Practical
Solution
to Your
Small
Bearing
Problems...



NORMA-HOFFMANN Small BEARINGS...

Wherever your designs call for *small* bearings, that's the time to *specify* and *use* Norma-Hoffmann Small Bearings. For like all Norma-Hoffmann bearings, these small precision bearings are engineered to give efficient, trouble-free service for years on end. They are extra quiet in operation... require little if any maintenance... improve the performance of the product.

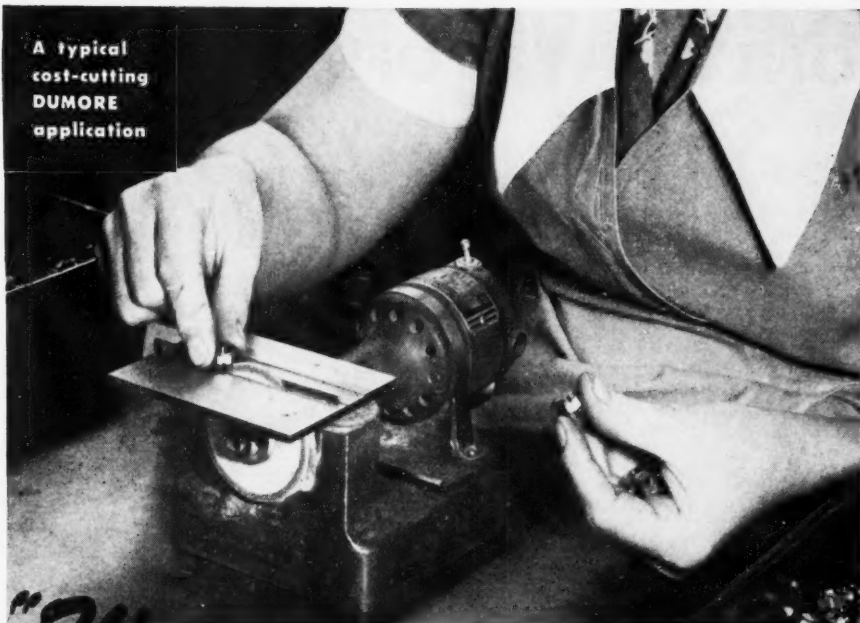
Write for catalog describing these *small* bearings as well as other Norma-Hoffmann Bearings. They are available in a wide range of types and sizes from $\frac{1}{8}$ " to $2\frac{3}{4}$ " bore... a type and size to meet every speed, load and duty.

NORMA-HOFFMANN
Precision
BEARINGS
BALL • ROLLER • THRUST

NORMA-HOFFMANN BEARINGS CORPORATION
STAMFORD, CONN.

Field Offices: New York • Chicago • Cleveland • Detroit • Cincinnati
Los Angeles • San Francisco • Dallas • Seattle • Phoenix

A typical
cost-cutting
DUMORE
application



"We can't afford thousands of dollars for special machines"

"but no production unit we've seen approaches low cost of Dumore Handgrinders!"

says C. A. Ewing, Supt. of Raush Nut & Mfg. Co., Cleveland. Using special fixture with adjustable table (cost \$50 - \$75) and mounting Dumore Series 8 or 10 handgrinder, Raush Nut deburrs up to 500 stainless steel hex nuts per unit per hour. Total cost per 100 including grinder, fixture, current, supplies and labor is less than 36¢.

"Still Own Every Dumore Ever Bought"

Raush Nut owns 30 Dumores, some as old as 15 years, uses them in tool room and maintenance, as well as production

... operated most of them 24 hrs. per day at peak production. No wonder Supt. Ewing says, "High speed and precision built into Dumore Grinders insures accuracy and trouble-free production!"

Ask your Dumore Distributor to show you, in your own shop, how Series 8 and 10 handgrinders can up your finishing output, slash your costs. Call him today or write for literature to: The DUMORE COMPANY, Dept. L-33, Racine, Wis.

DUMORE

DH-1



ONLY DAVIS OFFERS

Flame Hardened **BORING BARS**



Gain These Advantages Over Carburized Boring Bars:

1. Heavier Boring Without Permanent Set.
2. Heat Treated Alloy Steels with Higher Tensile Strength.
3. Deeper Case and Uniform Hardness.

We engineer and build all sizes and types of boring tools from $\frac{3}{4}$ " diameter to 8" diameter by 20' long.



SEND US
YOUR PRINTS FOR DAVIS-
ENGINEERED SOLUTIONS TO YOUR BORING PROBLEMS.



DAVIS BORING TOOL DIVISION

of Giddings and Lewis Machine Tool Company
FOND DU LAC, WISCONSIN, U. S. A.

NIAGARA

Announces New, Improved Circle Shears

**FOR CUTTING CIRCULAR BLANKS, DISCS OR CIRCULAR ARCS OF
20 GAUGE SHEET STEEL IN CIRCLES
UP TO 48" DIAMETER**



*Niagara Circle
Shear
with rigid
electrically
welded stand.*

NEW SAFETY - Gears are completely enclosed within housing.

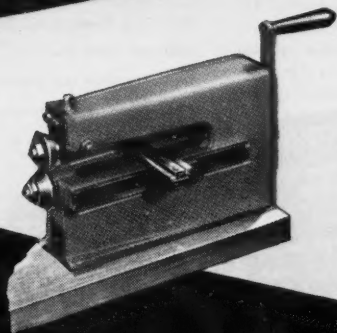
EASY OPERATION - Hobbed steel gears are smooth running. Quick acting center clamp holds the blank. Unmarked sheets can be quickly centered by adjustable swinging gauge. Graduations on bed show approximate diameter of circle.

NEW CUTTING HEAD - Box section design provides strength to maintain cutting and clearance angles for clean accurate work. Cutters and shafts are adjustable. Cutting head can also be used for slitting.

*Ideal for bench
mounting.*



and New Rotary Slitting Shears



**FOR STRAIGHT LINE CUTTING,
SLITTING AND TRIMMING**

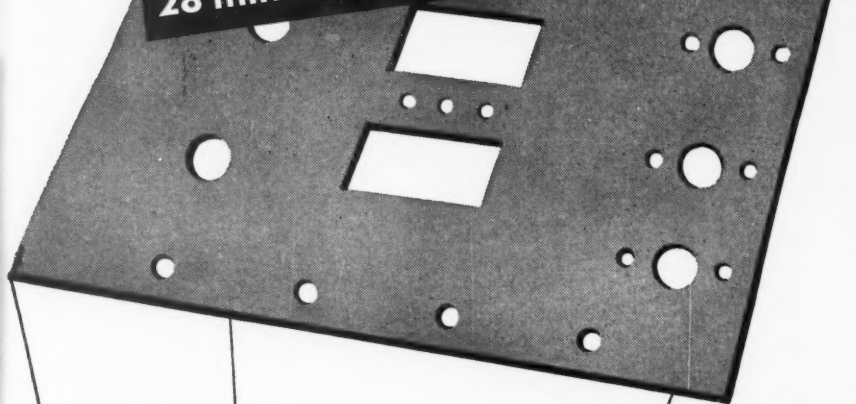
This is the lowest cost type of machine for slitting long sheets. Patented slitting gauge which is always parallel with the cutters controls the width of strip up to 9". Gauging surface is replaceable at low cost.

WRITE FOR DATA:

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.
DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

if it takes you more than

28 minutes to pierce this *first* panel...



then you'd better get a **WIEDEMANN**

The same short run piercing job took 28 minutes on a Wiedemann R-4P because layout time was completely eliminated. There was no waiting for the die set-up man . . . all punches and dies were carried in the turret of the machine right at the operator's fingertips.

There's a Wiedemann Turret Punch Press that can save you both time and money on every short run piercing operation . . . chassis, instrument panels, electrical boxes, bus bars, sheet metal parts, and plate up to $\frac{3}{8}$ " in thickness.

HERE'S THE ACTUAL JOB!

Check these production times . . . typical work of the R-4P.

- * 42 strokes required to complete job
- * 8 different dies required - R-4P Pin Type Gauge
- * Total time to produce first piece . . . 28 minutes
- * Time for every subsequent piece . . . 9½ mins.



WIEDEMANN MACHINE CO.

4219 WISSAHICKON AVENUE,
PHILADELPHIA 32, PA.

**MODEL
6-G**

SELLERS DRILL GRINDER

QUICKLY PAYS FOR ITSELF IN DRILL MAINTENANCE SAVINGS

● INCREASED PRODUCTION

Free cutting accurate drills permit drilling machines to be operated at their most efficient speeds.

● LONGER DRILL LIFE

Less drill material is ground off when re-sharpening drills.

● MORE HOLES PER GRIND

Correctly ground—drills remain sharp for a greater number of holes.

● REDUCED ASSEMBLY COSTS

Eliminates under- and over-size holes. Saves reaming and boring.

● RECLAIMS DAMAGED DRILLS

Sellers grinding method reclaims many burned and broken drills that are ordinarily scrapped.

● ECONOMICAL

This Sellers Grinder has been known to have earned its original cost as many as six times over within a single year.

Among Heavy Machine
Tools built by
Consolidated are . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND
MILLING MACHINES
DRILL AND TOOL
GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

The Sellers 6-G Drill Grinder provides an improved method of grinding that produces correctly formed drill points and duplicate lips. It automatically determines proper clearance according to drill size and grinds drills to equal length for use with multiple spindle drilling machines. This method materially reduces drill maintenance costs. A wet grinder that is especially adapted to grinding high speed twist drills from 1/4" to 3" diameter.

Send for complete information

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

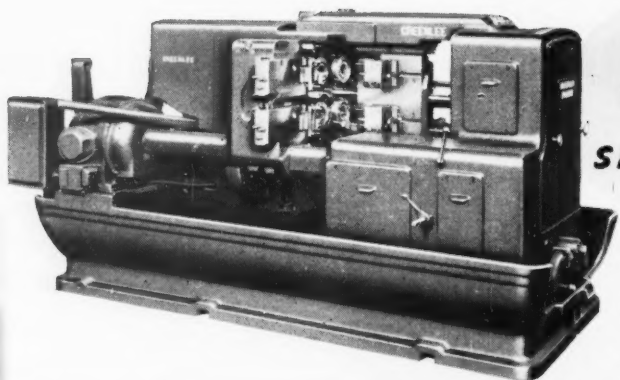
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CONSOLIDATED

MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK



4
SPINDLE

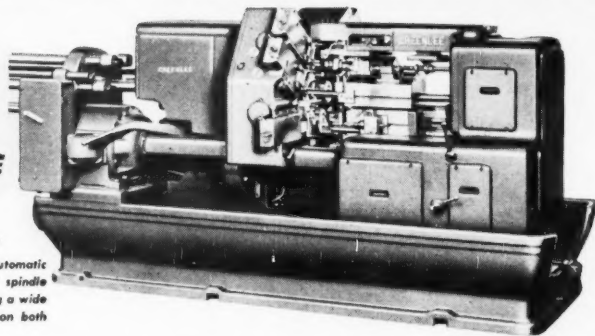
THE GREENLEE "FOUR"

A heavy-duty automatic made in 1½" and 2½" spindle capacities. The "Four" incorporates all the cost-cutting features of the well-known "Six" (see below).

GREENLEE

AUTOMATIC SCREW MACHINES

6
SPINDLE



THE GREENLEE "SIX"

A ruggedly-built, high-speed automatic ... available in 1", 1½", and 2" spindle capacities ... capable of handling a wide range of work ... widely used on both short and long-run jobs.

OUTSTANDING FEATURES OF ALL GREENLEE AUTOMATICS

Write for literature describing in detail all the features of Greenlee Automatics.



UNIVERSAL TOOLING — Tool holders fit any cross-slide cavity ... are easily and quickly changed ... reduce equipment costs.

INTERCHANGEABLE CAMS — Can be changed at will without re-adjustment of tools and holders. Cam storage is held to a minimum ... cam costs greatly reduced.

BUILT-IN THREADING DRIVE AND FEED — Not an extra attachment, but standard equipment on Greenlee Automatics.

BUILT-IN COOLANT SYSTEM — Eliminates cumbersome piping in tooling area ...

gets coolant right where it does the most good.

LARGE TOOLING AREA — Permits using many timesaving, cost-cutting auxiliaries that often eliminate second operations. Various special adaptations of standard Greenlee Automatics can be made ... for handling second-operation work ... for tooling extra-long work pieces ... for multiple feed-out arrangements, etc. Send us details of your work. Let our engineers show you how profitably Greenlee Automatics can be applied to your production.

GREENLEE BROS. & CO., 1891 Mason Ave., Rockford, Ill.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

AHCOWET-CG

THE COOLER COOLANT

HAS
DETERGENCY
PLUS
PENETRATION

Ahcowet C G contains a combined detergent and wetting agent. It completely penetrates all grinding, cutting and working surfaces. Costly heat is dispersed quickly... lubrication is complete! Ahcowet is a product of New England's oldest industrial chemical company. Tested and proven in America's largest industrial plants.

AHCOWET C G MEANS —

FASTER PRODUCTION—rapid dispersion of heat gives faster, heavier cuts; closer tolerances; better finishes.

LOW COST—more suspended solids give longer tool life; fewer regrinds.

EASY TO USE—will not sour, is odorless and absolutely harmless to the skin. Tools and work kept free from sludge, dirt and clinkers.

Send for Free Booklet

ARNOLD, HOFFMAN & CO., INC.

Machine Tool Division

55 Canal Street, Providence, R. I.

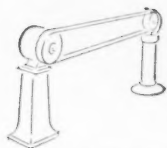
Please send me further information about Ahcowet C G.

Name

Firm

Address

City and State



BACKSTAND-BELT GRINDING INCREASES PRODUCTION IN POLISHING AND FINISHING

The coated abrasive belt used in conjunction with contact wheel today is established as an efficient production tool. For grinding, polishing and finishing hundreds of consumer and industrial items, the backstand-belt method today has been proved much more efficient and economical than has the old set-up wheel method.

Five Advantages

Manufacturers who have switched from the set-up wheel method point to five distinct advantages of the backstand-belt

method over the set-up wheel . . .

- An abrasive belt is a scientifically made tool, manufactured under controlled atmosphere conditions by experts utilizing modern making equipment. The photomicrographs compare the crude, uncontrollable rolled-on cutting surface of typical set-up wheel (A) with the coating on an Armour Abrasive Belt (B). Note how the sharp cutting points on the factory-coated belt are exposed to provide faster, cleaner cutting action—increased production.



A



B

- The coated abrasive belt cuts cooler because of the longer interval between work contacts.

- Inexperienced help can be quickly trained to operate a backstand-belt machine. Skilled personnel needed to dress set-up wheels can be used elsewhere.

- It takes only a few seconds to change an abrasive belt.

- The temperature-controlled room used for curing set-up wheels can be released for other more productive uses.

Actual Case History

The W. L. and Metals Company used a hard, set-up polishing wheel on aluminum sand castings for aircraft and transportation industries. The wheels had to be inspected constantly for out-of roundness.

When the company changed to the backstand-belt method, removing gates and fins from castings was no longer a drawback to production. With this new method abrasive costs were lower and the finish much better. The entire operation was speeded up 50-60%.

It will pay you to investigate the modern backstand-belt method. Write today to the Coated Abrasives Division, Armour and Company, North Benton Road, Alliance, Ohio, for the booklet — "Facts about Backstand-Belt Grinding and Polishing."

Need Coated Abrasives? Call Armour!

Backstand belts are only one item in Armour's complete line of coated abrasives. Alundum, Garalun, Garnet and Crystolon come in rolls of paper, cloth or combination . . . in sheets for hand sanding in belts, discs, and other specialized forms.

Whatever your products or specialized needs . . . one of Armour's complete line of metal-working abrasives is *right* for you.

We recommend buying through your
Industrial Distributor.

ARMOUR

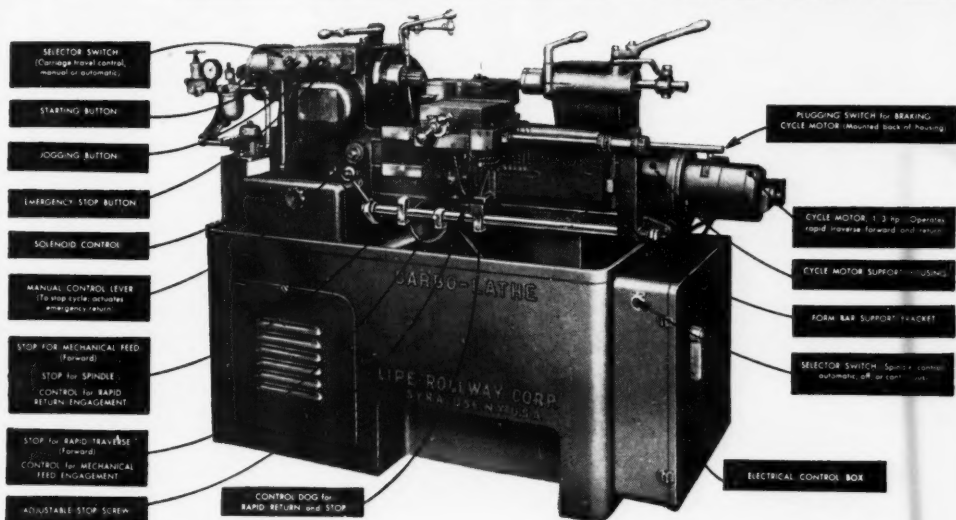
Coated Abrasives

Armour and Company
North Benton Road, Alliance, Ohio

COMPLETE CYCLE ELECTRICALLY CONTROLLED

STEPS-UP PRODUCTION!

REDUCES FATIGUE!



LIPE *Carbo-Lathes*

For fast, simple operation, just push the starting button . . . Instantly the spindle starts, the carriage moves rapidly up to the cutting position, and the mechanical feed engages automatically.

At the end of the feed cut, the mechanical feed disengages and the carriage stops for predetermined length of time to allow tools to clear themselves. At the precise moment, the spindle stops and the carriage returns quickly to the loading position, all ready for the next operation.

GET MORE PRODUCTION FROM YOUR PRESENT LIPE CARBO-LATHES

LIPE Automatic Complete Cycle Attachment may be used on any LIPE Carbo-Lathe bearing a serial number of 200 or more, and may be used on either plain or taper turning type front carriage. See your LIPE Distributor for full money-making details.

IMMEDIATE DELIVERY

Your operator always has control. With the manual control, he can disengage and re-engage feed . . . stop spindle . . . return carriage at any point in the operation.

The selector switch permits continuous operation of the spindle. The push button or remote limit switch starts feed at the beginning of cycle. Complete change of set-up can be made in just a few seconds by moving only three adjustable stops.



LIPE - ROLLWAY CORPORATION

Cable Address: LIPEGAR

814 Emerson Ave.

Syracuse 1, N. Y., U.S.A.

POPE

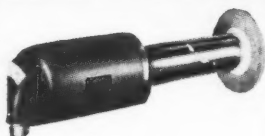
has exactly what you are looking for
in **MOTORIZED**
PRECISION SPINDLES
Here is a representative showing.



P-2500

POPE Heavy Duty Motorized Spindle for surface grinders, planers, boring mills and other machine tools.
In standard sizes from $\frac{3}{4}$ HP to 20 HP and from 900 to 3600 RPM.
Available with flange, tapered or special nose for quick mounting of wheels or tools. Ask for Catalog No. 58.

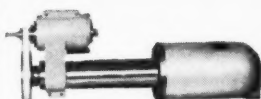
POPE Sealed-In Lubrication



P-32T

POPE Direct Motorized Cartridge Type Spindle for 6" x 18" Surface Grinders and other uses with 1 HP, 3600 RPM totally enclosed motor—a sealed package.

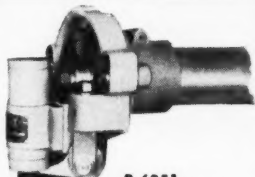
POPE Sealed-In Lubrication



P-6271

POPE High Speed Horizontal 15,000 RPM Spindle Attachment on a P-32T Spindle for 6" x 18" Surface Grinders.

POPE Sealed-In Lubrication



P-6351

POPE High Speed Vertical 15,000 RPM Spindle Attachment on a P-32T Spindle for 6" x 18" Surface Grinders.

POPE Sealed-In Lubrication



P-5552

POPE Heavy Duty, High Frequency, Direct Motorized, Cartridge Type Milling Spindle. 15 HP, 14,400 RPM totally enclosed, water cooled motor, 240 cycles, 3 phase.

Oil Mist Lubrication



P-5681

POPE High Frequency Direct Motorized, Cartridge Type Spindle, with 1 HP motor at 7200, 10,800, 14,400 and 21,600 RPM, using 240 and 360 cycle current in combination with a two-pole, four-pole motor.

POPE Sealed-In Lubrication

These Spindles provide you with:

Continuous, Maximum Production . . . Uniformly High Quality Surface Finish . . . Cool Operation at High Speeds . . . **Sealed Lubrication**—no oiling or greasing, nothing to renew, replace or adjust throughout the entire life of the bearings.

No. 64

POPE

TRADE MARK REG. U.S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

281 RIVER STREET • HAVERHILL, MASSACHUSETTS
BUILDERS OF PRECISION SPINDLES

Your Ampco distributor stocks Asarcon 773 bronze rod and tubes in mill lengths. He custom-cuts your order to any size!



A-39A

No scrap ends . . . cut costs . . .

Specify the exact length you need when ordering

Asarcon 773 Bronze

Cut your maintenance costs, get your order custom-cut to exact size by your Ampco distributor

You have always had to buy bronze rod and tube in 13" lengths — no matter how little you actually needed. The oversize was waste, an unnecessary addition to your costs.

You no longer have to pay this premium. Your Ampco distributor now stocks Asarcon 773 bronze rod and tube in mill lengths and custom-cuts your order to exact lengths. Imagine how much this saves you in one year!

OTHER ADVANTAGES

Besides buying economy, Asarcon 773 gives you the special advantages of continuous-cast stock:

1. No scrap due to metal flaws
2. Longer tool life
3. Less machining time

Asarcon 773 is produced for Ampco Metal, Inc., by the American Smelting and Refining Company of Barber, New Jersey, by a patented, exclusive process.

Take advantage of these important savings to cut your maintenance costs. Place your bronze rod and tube business with the Ampco distributor in your area. Write for his name and address—and for full details on Asarcon 773 . . .

Ampco Metal, Inc.

DEPT. MM-11, MILWAUKEE 4, WIS.

Asarcon 773 is available through Kingwell Brothers Ltd., San Francisco, California, to users located in California, Oregon, Washington, Nevada, Idaho, Utah, Arizona, New Mexico, Colorado, Wyoming, and Montana.

Ampco's Continuous-Cast Asarcon 773

Solid bronze rod from $\frac{1}{2}$ " O.D. up, tubular rod from 1" O.D. up. Mill lengths: 26 $\frac{1}{8}$ ", 52 $\frac{3}{8}$ ", 104 $\frac{7}{8}$ ". A superior all-purpose bearing metal meeting SAE 660 specs. Nom. Analysis: 83% copper, 7% tin, 7% lead, 3% zinc.

New Production Line Gear Shaver For Heavy Duty Gears

Designed as a PRODUCTION machine, the new Michigan Model 873 rotary gear shaver (Fig. 1) brings to the finishing of heavy duty gears the ability to turn out such gears faster, more accurately and at lower cost. Completely automatic in operation, the 873 will handle spur or helical gears and involute splines of from zero (with 10" cutter or larger) to 18 or 24 in. diameter, and with face widths ranging up to 15 in. Once the machine is set up for a given gear type, it is necessary only to load the gear between centers and push a 'start' button to complete the entire operation.

Features of the new Michigan 873 include ability to shave gears by any of three methods—

1. **UNDERPASS**—(Fig. 2) tangential feed; one roughing and one finishing pass usually enough for any gear (up to 4" face). For finishing close shoulder gears, etc.; evenly distributed cutter wear.
2. **TRAVERPASS**—(Fig. 3) combined tangential and axial feed of the cutter. Evenly distributed cutter wear; cutters narrower than underpass. (Gears up to 5" face)
3. **TRANSVERSE**—(Fig. 4) infeed; rapid approach plus a slower intermittent infeed. For finishing widest face gears (up to 15" face) with narrow cutters.

Curve Shaving. Ability to curve-shave (crown) either narrow or wide face gears by any of the above three methods. Adjustable power-driven sine-bar mechanism rocks the work table about a center pivot for transverse and some traverspass shaving. Others curve-shaved by use of reverse-crowned cutters.

Floor Space. Greatly reduced compared with previous machines designed for handling large gears.

Controls. All controls located at front of machine.

Faster Cutting, due to inclusion of a 'rapid approach'

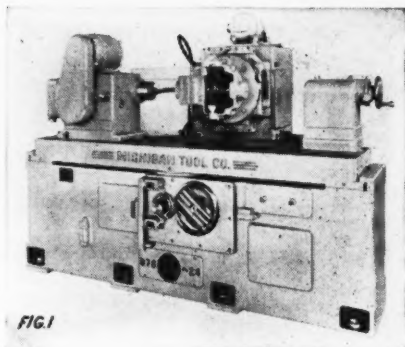


FIG. 1

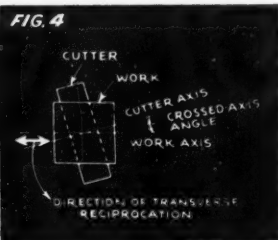
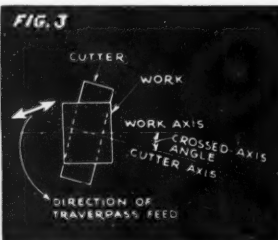
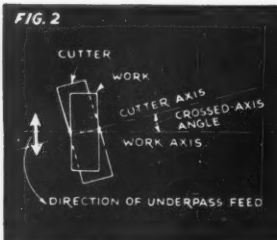
feed in the machine cycle, and automatic in-and-return feed.

Internal Gears. Special interchangeable cutter head provides for finishing internal gears on the 873.

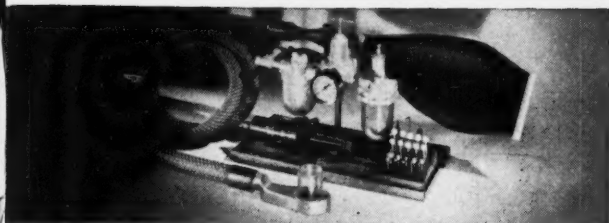
Adjustments of the 873 have been kept simple for fast setup. Crossed axis setting is speeded by adding a five thousandths indicator to the conventional vernier arrangement. Any of the three shaving methods may be selected by rotating the slide for the cutter head into proper position, mounting the correct cutter, adjusting center distance (by hand wheel at front of machine), and setting machine cycle. Limit switches regulate cutter reciprocation and head infeed.

Specifically designed for production line operation, the machine enables the use of unskilled or semi-skilled operators, further reducing costs. The operator merely loads the gear between centers and starts the machine by pushing a button. At the end of the complete machine cycle, the operator merely reloads. Machines are so designed that an overhead crane or hoist can be used to lower heavy gears directly between the centers.

For further information on the new 873 gear shaver, ask for Bulletin No. 873-49.



COMPLETE SYSTEM INCLUDES DUST ELIMINATION



WHEN Jig Grinding is required you can have it quickly and economically with the Vulcanaire. Place in the spindle of your Jig Borer (or Mill).

AND YOU CAN . . . locate—finish grind holes in hardened steel to "tenths" at controlled speeds up to 65,000 R.P.M. . . grind dowel holes—square with a ground base . . . move location of holes in hardened steel blocks . . . grind interchangeable holes in hardened sections . . . grind .032 to $\frac{1}{16}$ " holes with diamond impregnated laps . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . grind contours in gages . . . jig grind large and awkwardly shaped components . . . eliminate jig bushings in tools where close spacing is essential.

RESULTS! Jig ground requirements are being designed into tools by the most enlightened engineering departments . . . Jig ground the hardened die, stripper plate, and die holder all fit together . . . uniform clearance means longer runs.

ADVANTAGES! the investment is less than for many Jig Boring accessories such as a rotary table . . . the Vulcanaire can be put on and taken from the machine in a few seconds . . . the Vulcanaire is completely portable (all accessories are platform mounted) . . . the system can be used between several machines of various capacities . . . employing both

JIG GRINDING

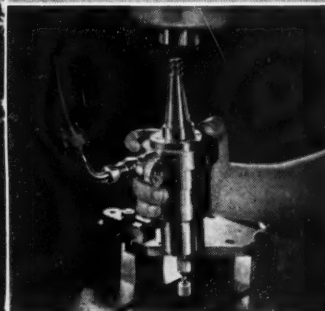
with the
Vulcanaire

the 10,000 and 20,000 series, components with various sized holes from the very smallest to 4" in diameter can be Jig Ground . . . the average Jig Borer operator becomes proficient at Jig Grinding after very little experience.

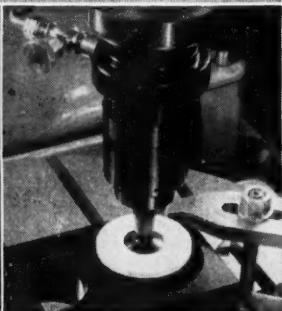
TOPS IN PRECISION . . . the Vulcanaire is precision built throughout and is constructed of alloy and tool steel. Super precision bearings, preloaded with our special fixtures are used, with all traces of radial and end clearances removed, resulting in Vulcanaire Jig Grinding to "tenths" . . . for quotation and literature please mention machine tool application.

VULCAN TOOL CO.

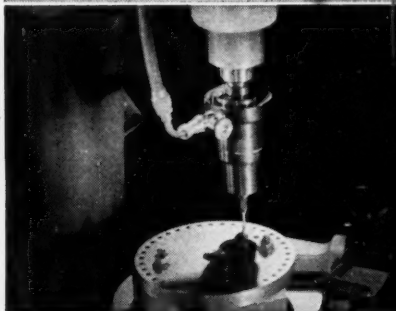
731 Lorain St.
Dayton 10, O.



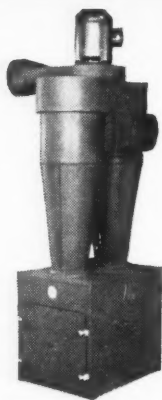
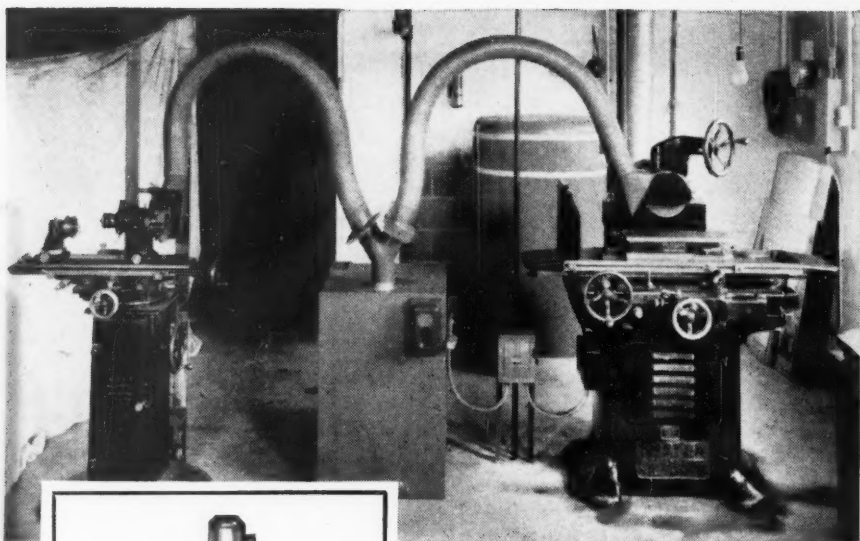
10,000 SER. $\frac{1}{16}$ "- $1\frac{1}{2}$ " HOLES
PUT ON TAKE OFF EASILY



20,000 SER. $1\frac{1}{2}$ "-4" HOLES
ADAPTORS INTERCHANGEABLE



FOR JIG BORERS OR MILLS



Torit Dust Separators

Torit also manufactures a line of cyclone type dust separators. These range in size from $\frac{1}{2}$ H. P. to 5 H. P. Many are designed for indoor recirculation of the filtered air. Pictured above is a Twin Cyclone unit that develops 2100 c.f.m., velocity 6000 ft. per min., static pressure, 3".

Self-contained Torit Dust Collectors solve dust problem at A. J. Thomson Shop

Economical setups like this, where one collector does two full size jobs, are one of the many reasons why thousands of plants use Torit. The two grinders pictured above rarely run at the same time, so cutouts in the piping direct the full capacity of the collector to either machine. Self-contained and portable Torit Dust Collectors will fit into your production picture. They will save you money both in initial installation and day to day operation. For details and the latest Torit catalog write:

TORIT

Manufacturing Co.
296 Walnut St. St. Paul 2, Minn.

Hardened Tool Steel Vees

60 ROCKWELL C

protect the carriage ways of
"AMERICAN" PACEMAKER LATHES

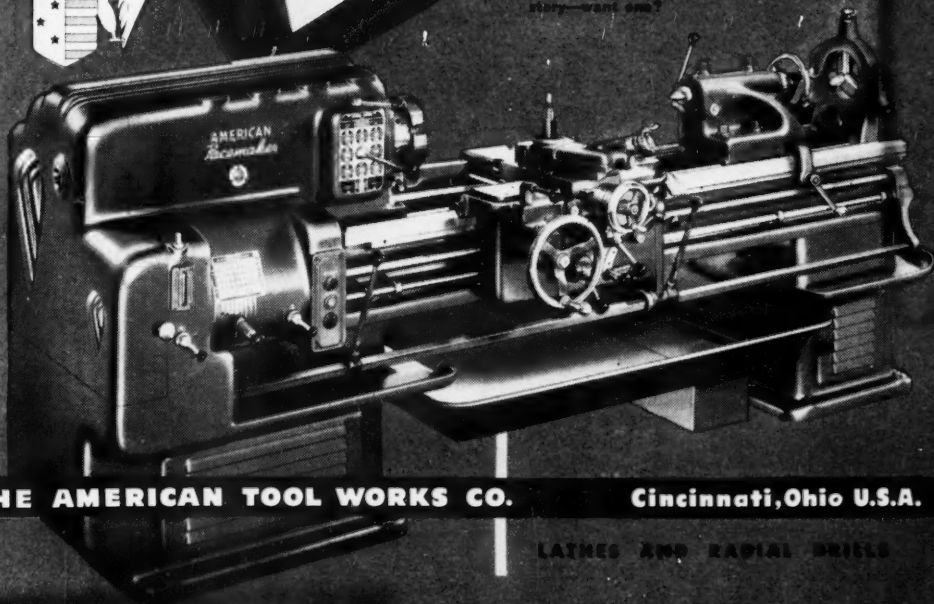
They are standard equipment
on all "AMERICAN" Lathes

These hardened vees are made of
tool steel and ground to gauge tolerance
for interchangeability should replacement
ever be required.

After hardening, the metallic
grain structure is stabilized by
temper treatment at minus 10
Fahrenheit to prevent twisting
or warping.

This feature is but one of
outstanding advantages offered
by the new "AMERICAN" Pacemaker Lathes.

Bulletin No. 18 gives the complete
story—want one?



THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio U.S.A.

LATHES AND RADIAL DRILLS

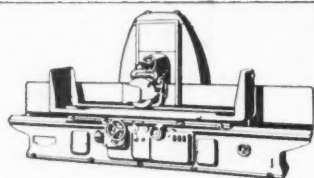
MATTISON GRINDERS

*If it's a Flat Surface to Grind
There's a Mattison to Grind it.*

● With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison now is in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced fixture engineers are available to give you best production efficiency with Mattison Machines.

For any flat grinding, ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalog on all machines, ask for free copy of general bulletin.



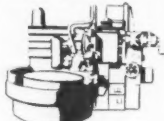
Precision Surface Grinders
Horizontal Spindle



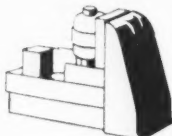
Disc Grinders,
Double Spindle Type



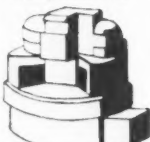
Vertical Spindle
Disc Grinders



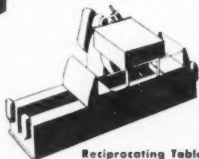
Plano Grinders,
Rotary Table Type



Rotary Table
Surface Grinders



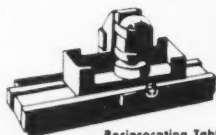
Automatic Rotary
Surface Grinders



Reciprocating Table
Face Grinders



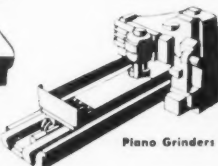
Disc Grinders,
Single Spindle Type



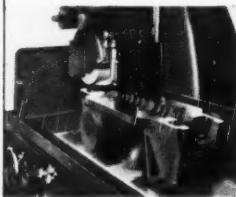
Reciprocating Table
Surface Grinders
Vertical Spindle



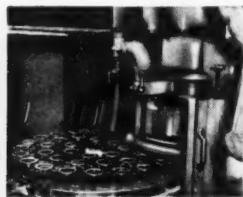
Face Grinders,
Traveling Wheel



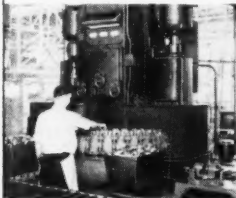
Plano Grinders



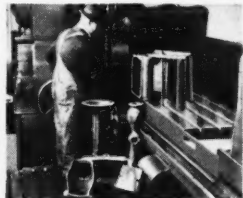
40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder



120 surfaces of cast iron compression heads per hour, removing 1/32" stock with Mattison No. 24 Rotary Surface Grinder



900 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder



Shows variety of work run on Mattison Face Grinders

MATTISON

MACHINE WORKS

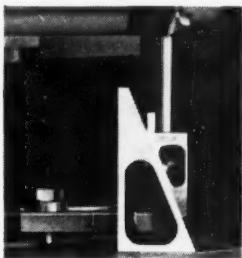
ROCKFORD · ILLINOIS

A MASTER TOOL
WITH MANY USES

LUFKIN

Master Planer Gage

A FEW OF
ITS MANY APPLICATIONS



Used to Set Cutting Tool. Note
Use of Extension Bar.



Used with Gage for Setting Up
Work on a Surface Plate.

ALSO

- Used with Sine Bar in Grinding Angles.
- Used with Indicator for Transferring Measurements.
- Used as an Adjustable Parallel.

Write Dept. MM for
fascinating booklet,
"The Amazing Story
of Measurement." En-
close 10¢ (no stamp)
to cover handling and
mailing.



THE LUFKIN RULE CO.

Saginaw, Michigan
New York City
Windsor, Canada



Gage Being Set to
Micrometer Accuracy.

• Typical of Lufkin's never ending research program to bring the latest and finest precision tools to mechanics in every field is this Master Planer Gage. Truly a "Master" Tool, it serves not only as a better Planer Gage, but also easily—accurately—quickly handles many jobs for which the ordinary gage is unsuited.

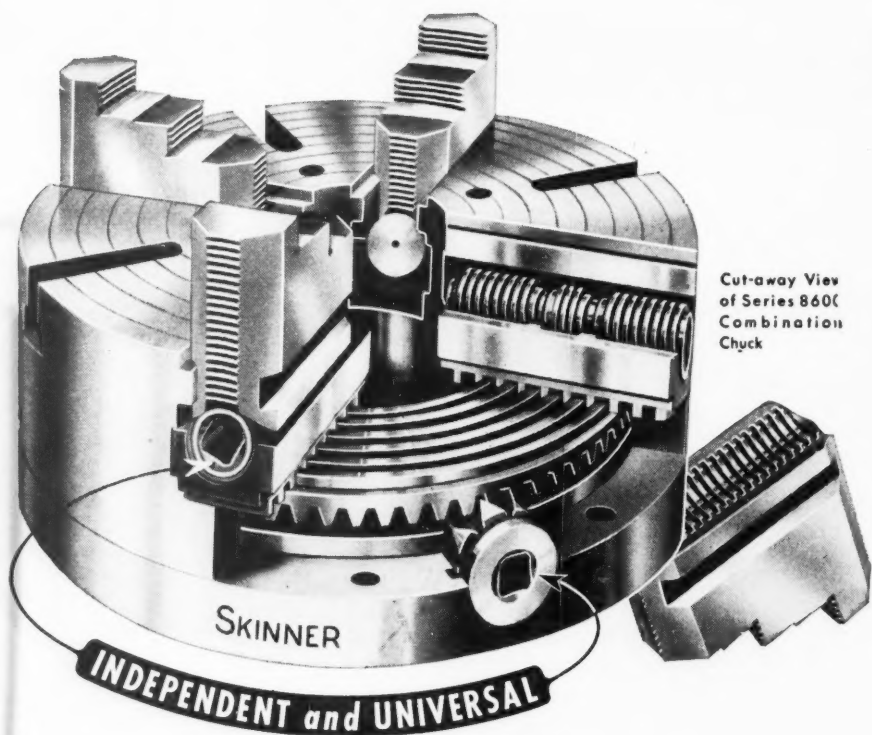
Skilled hands instantly sense its precision workmanship—the measuring surfaces all precisely ground—the accurate fitting of slide and base—and the smooth travel of the slide in a slot beveled as well as ground to eliminate side play and assure accuracy.

You'll find equally superior features in our entire line of precision tools. Ask your distributor to show you this fine tool—and look over other tools in the Lufkin family such as the easy-to-read Chrome Clad Inside and Outside Micrometers with non-glare satin finish—the Balanced Double Telescoping Gage—Patented Radius Gages providing five applications for each gage—and many others.

There's a Lufkin tool to meet every measuring need.

Buy **LUFKIN**

PRECISION TOOLS • TAPES • RULES
FROM YOUR DISTRIBUTOR



...it's a Skinner *Combination* Chuck

The fast, accurate way to chuck parts of irregular shape

Combining the flexibility of an independent chuck with the fast gripping and releasing action of a Universal chuck, a Skinner Combination Chuck simplifies and speeds the mass production of irregularly shaped precision parts. Actually two chucks in one, a Skinner Combination Chuck allows independent and accurate positioning of each jaw to suit odd-shaped pieces. When set to hold the work precisely, the wrench may be applied to any pinion to move the jaws in unison as in a self-centering Universal Chuck, thus cutting repetitive chucking time to a minimum.

Skinner Combination Chucks are precision-made tools of exceptionally rugged construction. The well-proportioned bodies have jaw slots carefully machined to close limits with heavy ribs to securely guide the jaws in their proper plane. All working parts are made of suitable alloy steel properly heat treated for their particular function.

The Series 8600 Chuck shown above is but one of a complete line of three and four jaw Combination Chucks manufactured by Skinner. It will pay you to get full details on Skinner Combination Chucks if you are interested in a faster, more accurate way to chuck duplicate parts of irregular shape.

Complete information on Skinner Combination Chucks as well as on all other Skinner chucking and vise equipment is contained in Catalog No. 61. Write for your free copy today.

The Skinner Chuck Co.

340 CHURCH STREET, NEW BRITAIN, CONN.

Skinner Chucks



HAND & POWER OPERATED MACHINE CHUCKS—AIR CHUCK EQUIPMENT—FACE PLATE JAWS—MACHINE VISES

Fifth in a series of
Unusual Grinding
Wheel Operations

Ready for the dotted line!

- Slitting fountain pen nibs to allow for the proper flow of ink is a very exacting operation. This precision job is another example of the versatility of a grinding wheel.

Whatever YOUR grinding problem may be, BAY STATE can solve it . . . fast. Possibly the exact specifications to meet your requirements can be supplied directly from large stocks either in Westboro, branch warehouses, or from our distributors strategically located throughout the United States.

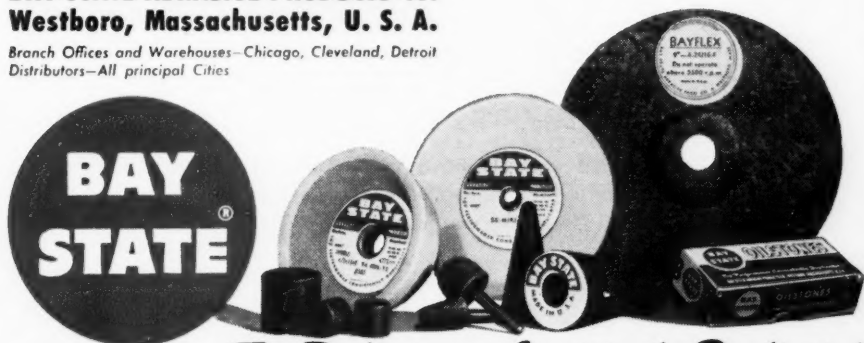
Send us your grinding problems. We can help you.

BAY STATE ABRASIVE PRODUCTS CO. **Westboro, Massachusetts, U. S. A.**

Branch Offices and Warehouses—Chicago, Cleveland, Detroit
Distributors—All principal Cities

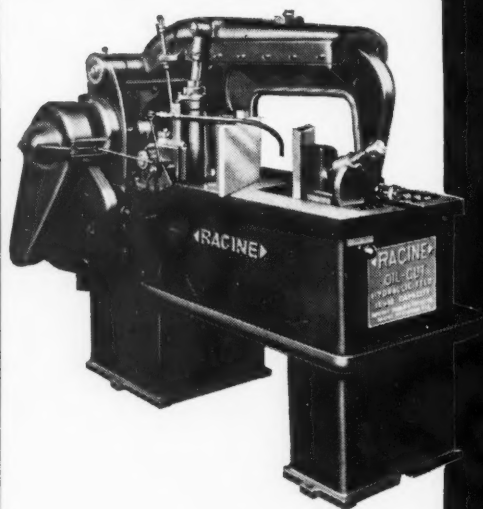


Photograph of Nib Slitting Operation Courtesy of The Esterbrook Pen Company



MEMBER OF THE
GRINDING WHEEL INSTITUTE

Top Performance Consistently Duplicated



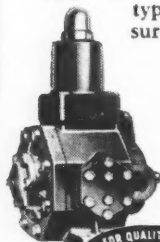
Presenting
THE
RACINE
 Model 60-CX
 10" x 10"
"Oil Cut"
HYDRAULIC
METAL CUTTING
MACHINE

COMPLETE HYDRAULIC OPERATION

Feed and pressure control, rapid transverse and lift on non-cutting stroke are all hydraulically controlled. This assures easy handling, proper blade application, accurate cutting and long trouble-free service.

RUGGED CONSTRUCTION

Heavy, wide table with replaceable table plates, swivel vice and three speeds are all standard. Heavy rib supported saw arm has wide "V" type gibs and large bearing surfaces for saw guide.



Racine's complete saw line includes models in all price ranges for general or automatic high speed metal cutting work. Capacities 6" x 6" to 20" x 20". Write for Racine's Complete Saw Catalog No. 12. Address RACINE TOOL AND MACHINE CO., 1770 State St., Racine, Wis.

RACINE HYDRAULICS — FOR MODERN CUSHION-LIKE POWER

Investigate RACINE'S line of oil hydraulic pumps and four-way valves. If you are planning on converting to hydraulic operation, our engineers will be glad to assist you — no obligation of course.



RACINE

Standard for Quality and Precision

L-W

5" UNIVERSAL 3-JAW LATHE AND SCREW MACHINE CHUCK

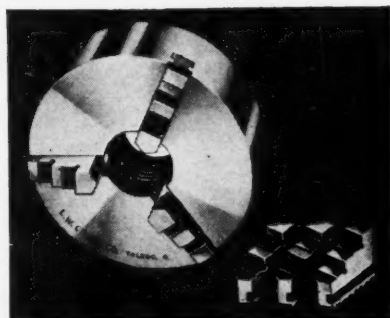
★ **UNUSUALLY RUGGED**

★ **HIGHLY ACCURATE**

★ **FINE QUALITY**

★ **LONG LIFE**

**A MOST
OUTSTANDING VALUE**



At the unbelievably low price of only
Fits any lathe having 1½"—8 thread spindle.
Using back adapter plate, it mounts on any
size or type. Weight 9 lbs. Fits L-W 6½" SD
Dividing Head.

\$25.30

3 TOUGH HARDENED STEEL PINIONS

Two sets of accurately cut, hardened and ground steel reversible threaded jaws. A tight grip always. Cast semi-steel body ground to fine finish.

| | | |
|------|---------|-------------------------|
| 6¼" | \$35.20 | Shipping Weight 18 lbs. |
| 7½" | \$44.25 | Shipping Weight 25 lbs. |
| 10½" | \$92.60 | Shipping Weight 70 lbs. |

| L-W 4-JAW CONVENTIONAL TYPE HVY. DTY. INDEPENDENT LATHE CHUCKS | | | |
|--|----------|-----------------|----------|
| 6" | \$ 18.30 | Shipping Weight | 11½ lbs. |
| 8" | 22.95 | " | 20 lbs. |
| 10" | 50.20 | " | 55 lbs. |
| 12" | 57.35 | " | 75 lbs. |
| 14" | 66.65 | " | 91 lbs. |
| 16" | 87.65 | " | 140 lbs. |
| 18" | 115.55 | " | 160 lbs. |

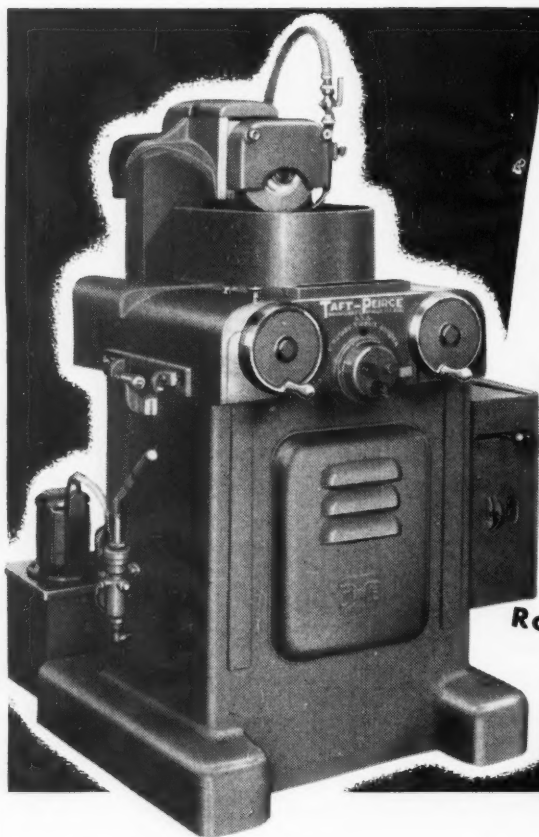
So sure are we that you'll be more than happy with the way any L-W product does a good job for you that we offer an unconditional money-back guarantee of satisfaction.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products



L-W CHUCK COMPANY

28 SO. ST. CLAIR ST.
TOLEDO 4, OHIO



Here's why you get
**HIGHEST
 PRECISION**
 and
FASTER WORK
 from
TAFT-PEIRCE
6"
Rotary Grinders

FAST SET-UPS . . .

Because of the exclusive tilting wheelhead, difficult shoulder and angle work is easily handled. Complicated set-ups are seldom required.

CLOSER TOLERANCES . . .

Full ball-bearing construction, extra-rugged design give truly accurate, vibrationless grinding. Surfaces with finer finishes — flat within exceptionally close limits of tolerance — are easily obtained.

EASY OPERATION . . .

All controls are grouped together for easy, fast operation. Operator fatigue is less, production substantially increased.

NEGLECTIBLE MAINTENANCE . . .

Hardened and ground ways, full ball-bearing construction, extra-sturdy design result in undiminished precision over an exceptionally long period of time. Users report amazingly low maintenance costs.

REDUCED WHEEL WEAR . . .

Operation is smooth and effortless — free from the vibration which causes uneven wheel wear and short wheel life in the conventional rotary surface grinder.

EASY GRINDING OF DIFFICULT PARTS . . .

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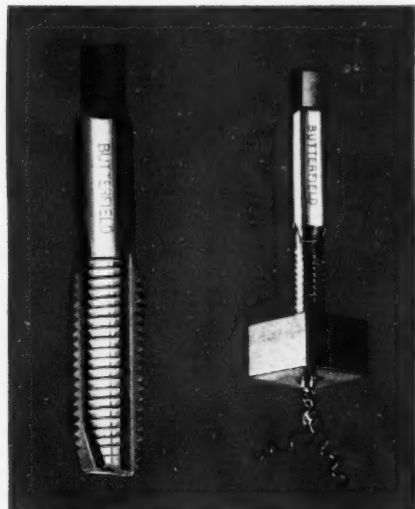
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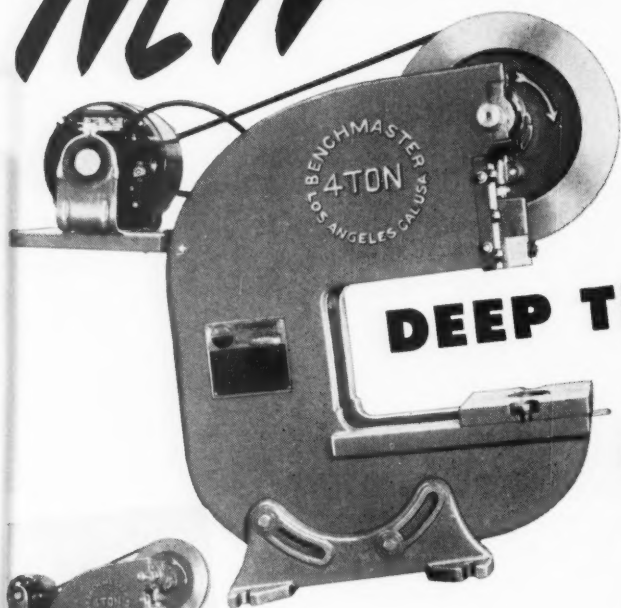
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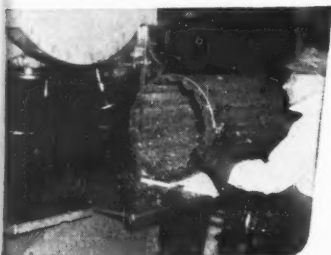
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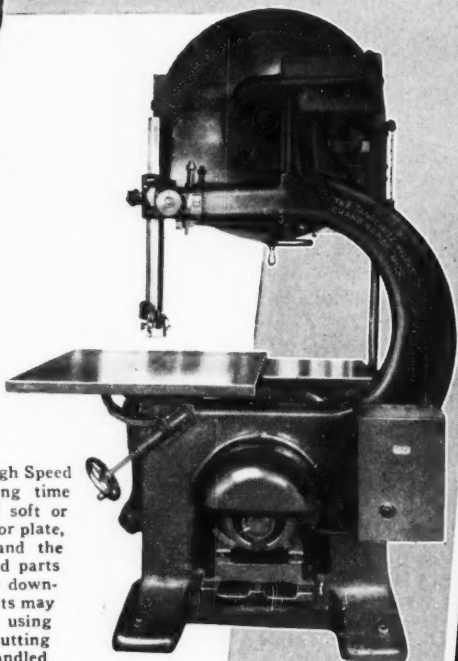


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MODERN Machine Shop

NOVEMBER, 1949

Vol. 22, No. 6

FEATURES IN THIS ISSUE

West Coast Firm Produces Complete Plants

By Gilbert C. Close

A most unusual article in which author Close describes the manufacturing operations involved in the building of equipment for complete oil refining and chemical processing plants. Page 100.

Machining Operations on Hoover Electric Cleaners

By Fred W. Vogel

The production machining of aluminum parts for vacuum cleaners requires the use of specially designed fixtures as well as high production machine tools. This article tells how the Hoover Company meets high production requirements. Page 116.

Handy Quality Control for the Machine Shop

By Clifford W. Kennedy

So great was the reader interest in the article on quality control which appeared in the August issue that we have prevailed upon Mr. Kennedy to discuss the subject further. The present article covers "standard deviation—frequency distribution" quality control technique. Page 126.

Induction Hardening, Part II

By Frank W. Curtis

A discussion covering the steels which are best adapted to the induction hardening process, proper methods of quenching induction heated workpieces, and progressive hardening. Page 144.

An Analysis of Shaving and Burnishing Dies

By C. W. Hinman

Mr. Hinman describes the construction of dies which are to be used in the blanking and perforating of light gauge metals and fiber materials. Page 174.

Sales Hints for the Smaller Shop

By Karl F. Kirchhofer

Mr. Kirchhofer describes several methods which smaller metal-working firms may use to more effectively advertise their services. Page 188.



Fig. 1—General view of main entrance to C F Braun & Co plant. The executive office building is at the left; the personnel building is at the right; a portion of the factory may be seen in the background.

West Coast Firm Produces Complete Plants

A description of the manufacturing operations involved in the building of complete oil refining and chemical processing plants.

By GILBERT C. CLOSE

A TOUR through the 40-acre C F Braun & Co plant, Alhambra, California, one of the nation's largest plants for the manufacture of petroleum refining and chemical plant equipment, offers a picture of modern industrial enterprise second to none. This picture includes not only production facilities but, in addition, concrete evidence of what can be accomplished by a well-defined company policy, by proper human and personnel relations, and by cooperation between production

and management. A view of the main entrance of the plant is shown in Fig. 1.

The very nature of the Braun Company's business demands a high degree of organization. Products produced at the plant range from complete oil refining and chemical processing plants; through a series of plant processing units such as heat exchangers, condensers, bubble columns, fired heaters, heavy pressure vessels, and so on; to the maintenance tools which are required to keep such apparatus in

satisfactory operating condition.

Braun officials are particularly proud of what they call their turn-key plant erection jobs. A production order for one of these jobs may call for a complete installation, such as an oil refinery, including office buildings, furniture, shops, processing units, sanitary facilities, and so on, to be erected on some remote oil frontier. The "turn-key" designation is derived from the fact that after the job is finished by the Braun Co., the plant is ready to be operated; the customer need only unlock the doors and take possession.

On turn-key jobs, all units that are able to be shipped are fabricated at the Alhambra plant. Some of these units require as many as three flat cars for transportation. Other units are even larger and, if loaded on flat cars, would not clear existing railroad tunnels, therefore these excessively large units are moved to the plant sites by truck.

Along with turn-key jobs, the company maintains a steady production of standard units which are used for replacement and/or for plant enlarge-

ment. Also, Braun engineers are available for soil surveys, maintenance surveys, and other types of industrial consulting work.

Good housekeeping is a rule throughout the plant, and evidence of the rule may be seen from the executive offices to the storerooms in which janitors keep their tools and supplies. "More work can be accomplished across a clean than across a dirty desk," is virtually a company motto. All shop aisles are kept well-swept and unobstructed; unused equipment is stored out of sight. Maintenance of plant site, buildings, and equipment is rigorously pursued.

Despite the size of the Braun organization, a genuine effort is made to make each employee feel that he and his job are important. Numerous facilities are provided for all of the employees including air conditioned rest rooms and restaurants. In the plant, individual employees are not lost in the industrial shuffle.

In order to promote good fellowship among employees, every effort is made

Fig. 2—General view of the machine shop at the Braun plant.



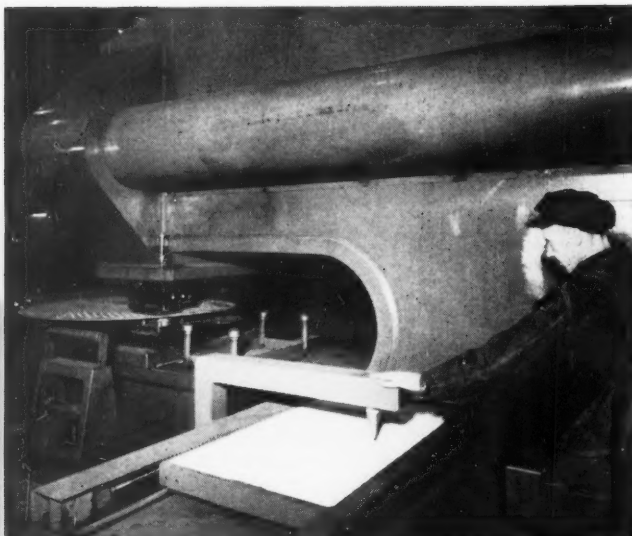


Fig. 3—"Electric eye" punch press. Mechanism for light beam is under operator's hand.

to erase job-level barriers. The courtesy title, "Mr.," is reserved for President C. F. Braun himself. Other employees, from vice-presidents down, are known to each other by their first names. Offices, except those which are used by top-ranking executives, are as alike as the proverbial peas in a pod. Office equipment, office libraries, and office furnishings follow the same pattern of uniformity.

The various factory shops cover approximately ten acres of the 40-acre factory site. The machine shop is located adjacent to the assembly area; and, needless to say, in an organization such as this one, machine shop facilities are modern, complete, and include many special and interesting tools. Furthermore, the same vigorous policies of good housekeeping, personnel recognition, and maintenance are applied to the machine shop as well as to other parts of the plant. A general view of the shop may be seen in Fig. 2.

Workpieces which are passed through the machine shop may weigh anywhere from a few ounces to many

tons. This fact necessitates specialized handling equipment. Overhead traveling cranes having capacities from 15 to 90 tons are used to do the major portion of lifting and transporting; auxiliary jib cranes, both air and electric powered, are spaced at intervals along each side of the shop and are used in lifting heavier workpieces into and out of position on machine tools; lighter work is transported by means of numerous lift trucks; and roller stands are used to support large workpieces which extend beyond many of the larger machines.

Machine shop personnel point out that the company policy concerning equipment is a direct asset in maintaining maximum shop production and efficiency. It is not necessary for shop supervisors to plead for new equipment. Rather, when the use of a new machine is justified, the machine is procured as soon as possible. When the machine needed is not available on the market, it is designed by company engineers and built to specification in the plant. Many of the most impressive pieces of equipment on the machine shop floor originated in this way.

Since most of the parts produced in the plant are used as components in pressure vessels, for which strength and safety requirements are critical, very few castings are used. Plain steel

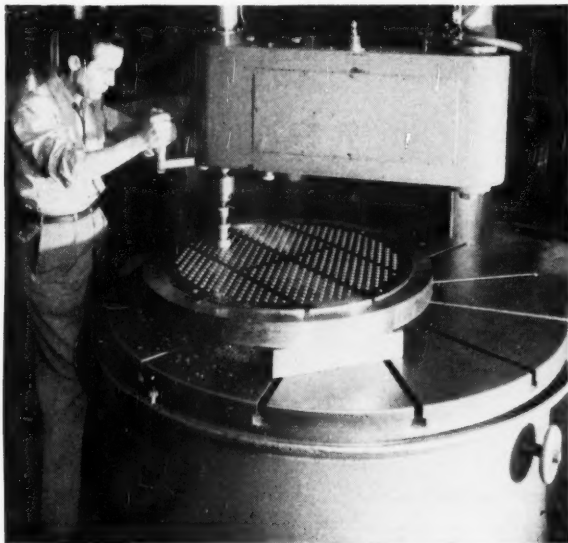
Fig. 4 — View of a special drilling machine used for drilling holes in tube covers and flanges.



plate is the material which is used for most of the parts; alloy steel plate is used when special corrosion or heat resistant qualities are required of the finished product.

The main toolroom at the Braun Company is air-conditioned, fluorescent lighted, and bears a striking resemblance to a well-kept hardware store. All tools are arranged in neat rows on shelves which are painted a light color for better visibility. Only tools needed currently are kept in sight. Diamond grinding wheels and other tool maintenance machines are

available on the floor. An alcove is provided at one side of the toolroom for receiving and dispensing shop laundry for those employees who wish to make use of the laundry service.



In general, shop tooling conforms with what might be expected in any shop of comparable size producing work of a similar nature. No machine, either standard or specialized, commercially available or made to order, is omitted if, with it, a special job will be done better. There are a few machines, however, which are peculiar to

Fig. 5—Braun-designed machine used for radial grooving of drilled holes.

Braun production and which will be of interest, it is thought, to other machine shop personnel and production engineers.

One such machine is a company-designed "electric eye" punch press which is used in piercing bubbletrays for processing columns. This machine, which is illustrated in Fig. 3, is operated automatically once it is started; and, in it, steel plates up to one inch in thickness may be pierced. A quarter-size layout of the pattern of holes which is required in a given bubbletray is drilled in a metal template, and the template is placed on a template holder which moves transversely in reduced ratio with the main press bed. A beam of light in the mechanism, directed downward, is positioned initially in line with a transverse line of template holes. When the machine is started, the template holder is moved until the first hole in the template is brought into position under the light beam. As the light beam passes through the hole in the template, it strikes the sensitive element of a

photo-electric cell located directly beneath. The activation of the photo-electric cell serves to stop both the template holder and the press bed, and to set in motion the punching mechanism.

This cycle is repeated automatically for each hole in the template in line with the first hole, each template hole being used for punching a corresponding hole in the bubbletray. After all of the holes in the first line have been punched, the "electric eye" is moved into position in line with a second transverse line of template holes; and the process is repeated. When finished, the holes in the bubbletray correspond, in an enlarged ratio, with the holes in the template.

Another machine of interest is a special drilling machine which is used in drilling column covers and flanges. A view of the machine may be seen in Fig. 4. Here again the action, once started, is automatic. The work to be processed is placed on a rotating drill bed which has been pre-adjusted to rotate a specific number of degrees

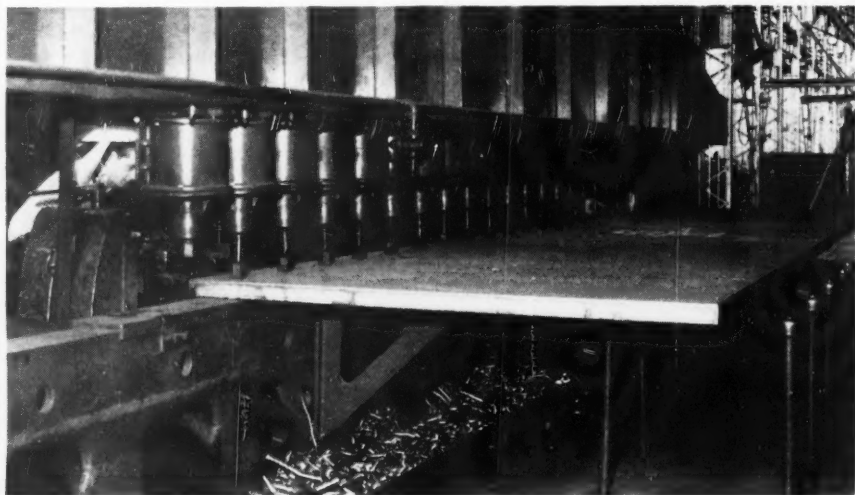


Fig. 6—Large plate-planer shown here is used for beveling edges of flat sheet stock.

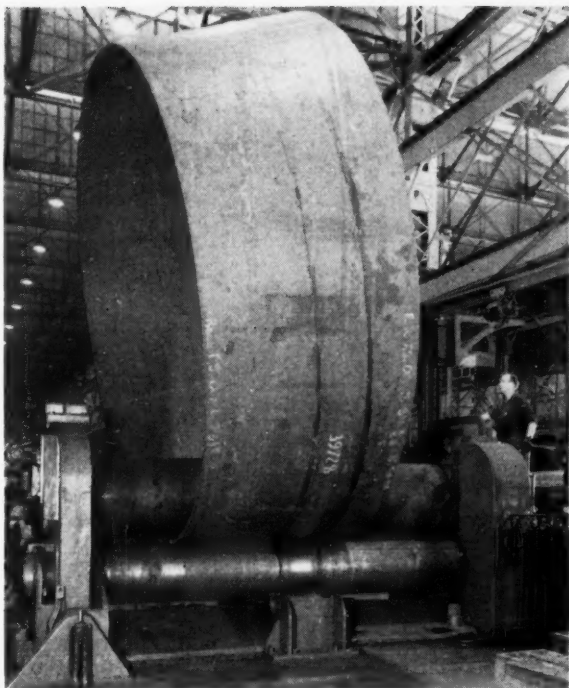
Fig. 7—Large column course is shown being formed in a heavy-duty plate roller.

after each hole is drilled. Use of this machine eliminates the need for designing, making, and using special drill templates.

Another Braun-designed machine is shown in Fig. 5. This machine is used for the radial grooving of holes which are previously drilled in tubesheets. The purpose of the grooves is to aid in anchoring tube ends in tubesheets and to provide better seals. The tool used for grooving is a mandrel which fits the drilled holes and which incorporates a fly cutter in order to cut the grooves while the mandrel is in position in the holes.

The huge processing columns which are produced at the Braun plant are first rolled from flat into cylindrical courses, and then the courses are welded together to make the columns. The edges of the plates used are beveled in order to obtain better weld penetration. The beveling operation is performed in a forty-foot plate-planer which is shown in Fig. 6. The planer is equipped with a beveling tool, and plate stock up to three inches thick may be beveled with this equipment. The plate being beveled is held firmly by means of a series of hydraulic clamps during the beveling operation, and its extending portion is supported on roller stands.

The metal forming department in



the plant is spectacular, to say the least. A heavy-duty plate roller, shown in Fig. 7, is used for forming cylindrical and tapered column courses. This roller, unlike most, is equipped with an hydraulic rather than with a mechanical pull-down device on the upper roller; and cold plate stock up to three inches thick may be formed into cylindrical column courses with the equipment.

Another metal forming machine of interest is a company-designed and built distributor mill for forming heat exchanger distributors. The machine is illustrated in Fig. 8. The operation performed in the machine is primarily a spinning process carried out on a large scale. One end of a distributor shell is heated in a gas-fired floor furnace, which is shown at the left in the illustration; and then the shell is placed,

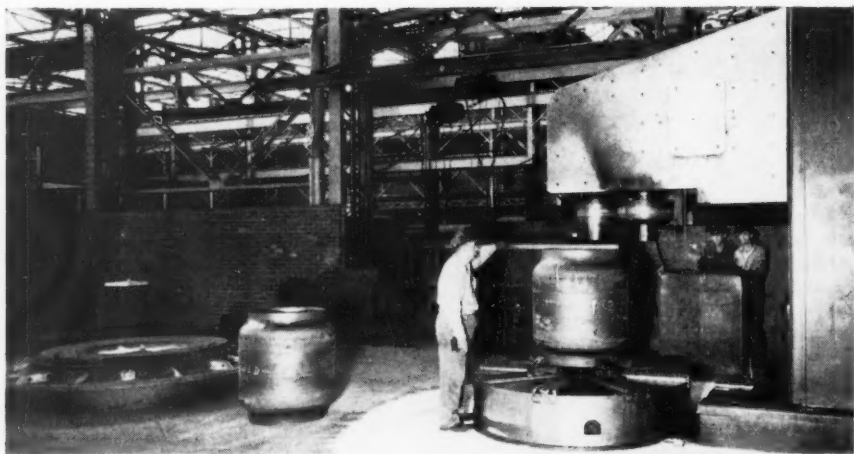


Fig. 8—View of company-designed distributor mill. Floor furnace may be seen at the left. Workman is shown checking O.D. of distributor shell.

heated end up, on a rotating, self-centering chuck table of the distributor mill. One roller, which is positioned to

extend down inside of the shell, is used to control the internal diameter of the shell; the second roller, which

acts against the hot metal as the shell is rotated, is used to spin the end of the shell to the desired outside diameter. After one end of the distributor shell has been formed, the other end is heated, and the forming operation is repeated.

The position of each of the rollers may be adjusted independently, and thus

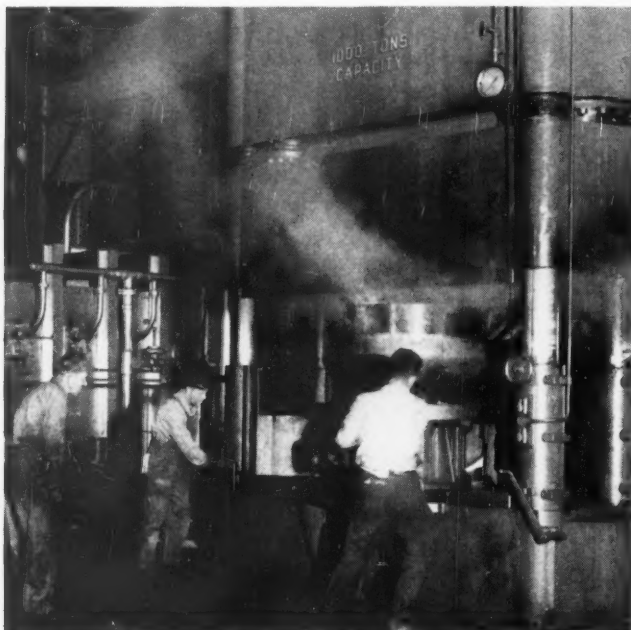
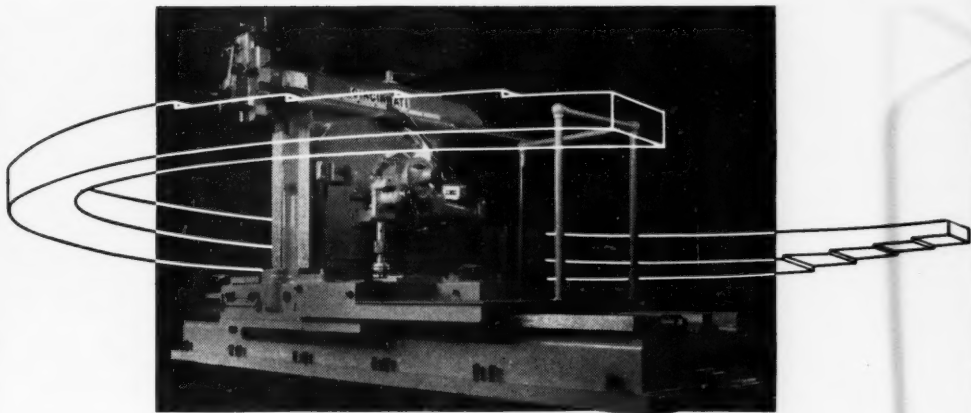


Fig. 9—1,000-ton press in which ellipsoidal column heads are formed.

8 ft. OF CROSS FEED

ON THIS CINCINNATI SHAPER



ONE SETUP SAVES TIME. Seven feet at end of 20-foot diameter cast steel generator half rings is machined with one setup as shown in schematic sketch above.

NEW! This new Cincinnati Traveling Shaper accurately machines surfaces requiring eight feet of table travel—with one setup.

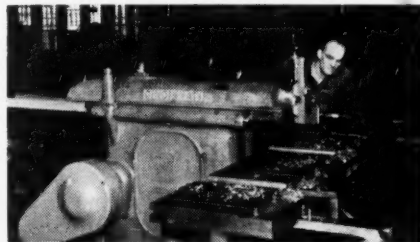
The operator rides with the machine so controls are always at hand. Accurate settings can be made easily at any point of travel with the vernier.

NEW ECONOMIES! This Cincinnati Traveling Shaper is effecting real economies for a large manufacturer of motor generators.

Steps are machined over a seven-foot length on the ends of seven-ton generator rings 20 feet in diameter. This one setup greatly reduces machining time on this otherwise awkward job.

NEW FIELDS! This application of powerful Cincinnati Shapers opens up new fields of use in the machining of long, interrupted surfaces on very large work.

Investigate the possibilities for you in this new Shaper development. Our Engineering Department will be glad to cooperate.



MANY APPLICATIONS, such as shaping slots in eight-foot table, are performed quickly and economically with a Cincinnati Traveling Shaper.

Write for the new Shaper Catalog—S-5.

THE CINCINNATI SHAPER CO.

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Fig. 10—Welds on a finished column are shown being X-rayed by a portable, 250,000 volt X-ray unit.

distributor shells fabricated from plate stock up to two inches thick may be formed with this mill. Operation of the mill is controlled through a control panel which is located far enough away to escape intense heat radiation from the hot metal being formed.

Two presses, having capacities of 500 and 1,000 tons, are used for hot forming ellipsoidal column heads. In the larger press, which is illustrated in Fig. 9, blanks up to 82 inches in diameter and two inches thick may be handled, and column heads up to 66 inches in diameter may be formed. Separate gas-fired furnaces, one for each press, are provided for heating the blanks prior to forming. The smaller press dies are of flexible design in order to facilitate removal from the formed parts.

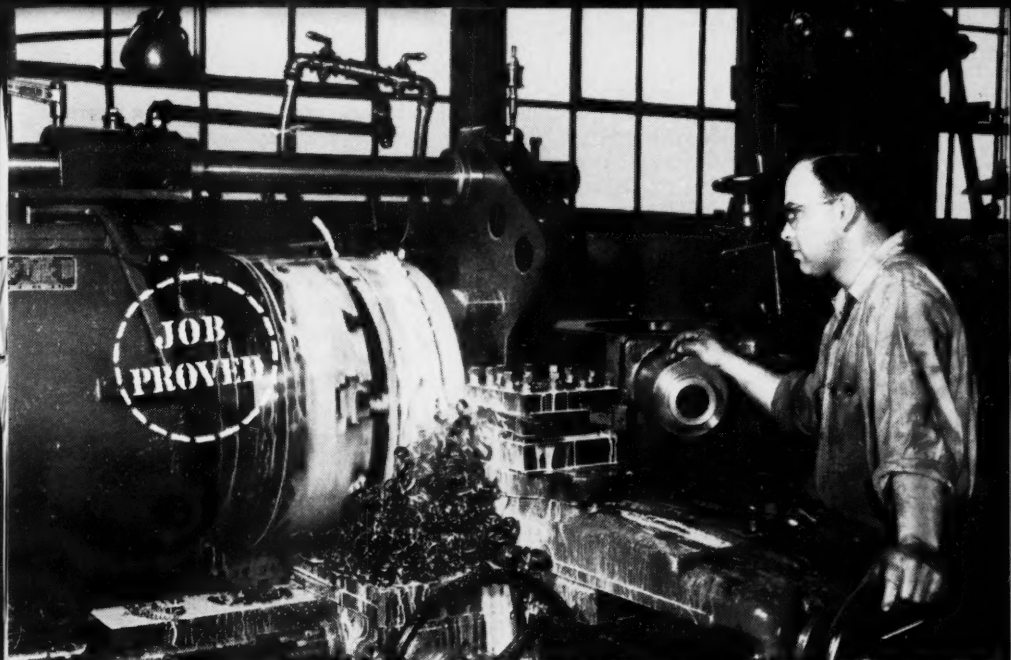
Torch metal cutting techniques

which are used by the Braun Company present many different and interesting features. Circular holes in column courses, in which nozzles are installed, are cut by means of a cutting torch which is mounted on the end of the scribing arm of a circular scribing machine. In another machine, which is used for cutting pipe by means of a torch, the torch remains stationary, and the pipe is rotated in a cradle at just the right speed to permit cutting. It is claimed that good tolerances are obtained from both machines.

Unionmelt welders are used for most of the operations performed in the welding department at the Braun plant.

Some of the automatic welders are stationary, and others are portable. A few of the welders are mounted on tracks which run parallel to the huge, rotating cradles used for positioning entire columns while the courses are being welded together. Weld positioners having capacities of more than ten tons are used for handling parts which cannot be held in rotating cradles.

Because most welded columns, towers, heat exchangers, and pressure vessels must be made to meet specific requirements of strength and safety, every care is taken to make certain that all welds are sound. Various tests are used to check each major weld. The welding equipment is set up to start the weld in a test plate just before the workpiece itself is welded. Later, the test plate is removed, machined, and tested.



S.E.C.O. BEATS COSTLIER CUTTING OIL

Competitive Product Fails to Match Fine Record of Sunoco Emulsifying Cutting Oil in Cost or Performance

For 27 years a metalworking shop used Sunoco Emulsifying Cutting Oil with complete satisfaction. Tool life was excellent and machines stayed clean. High production, with minimum scrap, was the rule year in and year out.

The following is typical of the difficult operations in which the Sun product was successful for so long.

Machine: Gisholt turret lathe, model 4L.

Part: 20" press mold shell 22 $\frac{3}{4}$ " O.D. x 6" wide x 20 $\frac{1}{4}$ " I.D.

Operation: Turning and boring rough forgings.

Materials: 40-50 carbon steel.

Tools: Firthite carbide tools.

Feed: .012 at 31 rpm.

Cut: $\frac{1}{2}$ " to $\frac{3}{4}$ " on O.D. and boring.

Two years ago the shop was persuaded to try a competitive oil on the above opera-

tion. Test results showed that the competitive oil, costing three times as much, lacked stability. Performance was far inferior to that of Sunoco Emulsifying Cutting Oil in regard to tool life and quality of finish. The company was convinced the original choice had been sound.

In all machine shop operations, on both ferrous and nonferrous metals, you'll find Sunoco Emulsifying Cutting Oil and Sunicut straight cutting oils of real assistance. They help maintain production schedules, lengthen tool life, and keep operating costs down. For a free Sun cutting oil recommendation card, write Dept.MM-11.

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"JOB PROVED" IN EVERY INDUSTRY



Every weld is subjected to and must pass thorough X-ray examination. Five portable X-ray units, having capacities ranging from 200,000 to 400,000 volts are used. The X-ray units are equipped with removable heads and extension power cables so that the tubes may be placed in the best positions, as required, for different exposures. A 250,000 volt unit is shown in Fig. 10 being used to X-ray welds on a finished column; here the detachable head is shown in

The temperatures to which the parts are heated are dependent upon the specifications of the metals used. The structures to be annealed are loaded on a flat car-like carrier, and the carrier is moved completely into the oven for an annealing operation. Thus a full load of parts is annealed at one time. Some of the structures are so large that one of them will fill the carrier completely, and therefore these parts are annealed individually.

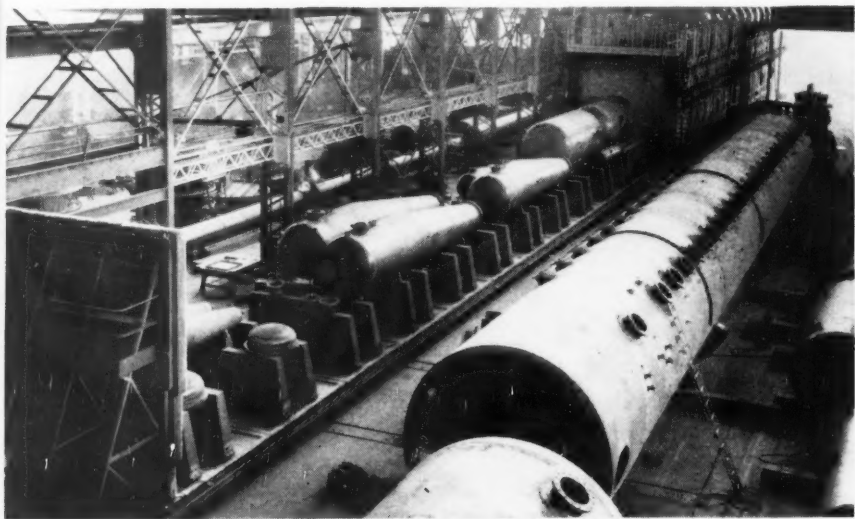


Fig. 11—Loaded carrier is shown ready to be moved into annealing oven (center background).

an extended position. The X-ray technician and nearby workmen are protected from harmful rays by means of portable lead screens. The plant maintains its own laboratory for processing X-ray film.

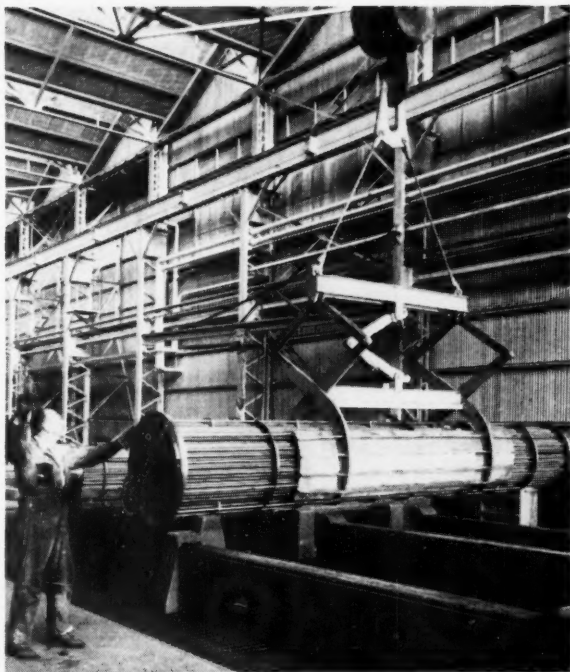
Many of the welded structures are stress relieved by annealing before they are shipped from the factory. A gas-fired annealing oven, which may be seen in Fig. 11, is used for this operation. The oven is 135 feet long, 15 feet wide, and approximately 16 feet high.

The assembly department, like the machine shop, is provided with various standard and special heavy-duty materials handling equipment. One of the special handling units is a special barrel-type tong unit which has been developed for handling tube bundles which are used in heat exchangers. A view of this unit is shown in Fig. 12. As may be seen, curved plates are positioned between tongs in order to prevent injury and crushing of the tubes which compose the bundles.

Fig. 12—Company-developed, barrel-type tong unit used for lifting tube bundles.

This article has only highlighted various features of the production picture at the Braun Company plant. Those who are familiar with petroleum refining plants and chemical processing plants, and who have noticed huge, cylindrical columns of steel towering as high as 17 stories in the air, will appreciate more fully the vastness and scope of work performed in a plant producing this type of equipment. If the interiors of the towering columns were visible, if the miles of intricately-laced tubing, the thousands of bubblecaps, the tube-sheets and floatingheads and baffles could be seen, the production picture would be even more impressive.

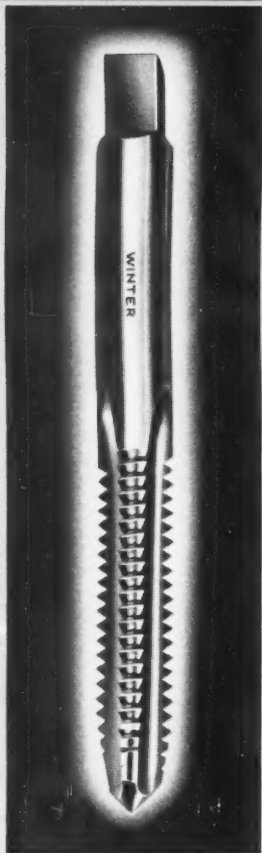
But aside from viewing a picture of vast production, aside from seeing many machines and many employees who man the machines, the casual



visitor at the C F Braun Co plant soon becomes aware of a definite, and yet an intangible, achievement. This is a combined achievement of cooperation, of human personnel relations, of good housekeeping, and of pride in jobs well done. It is the achievement of a plant personality expressed in terms most helpful to those who sponsor its existence.

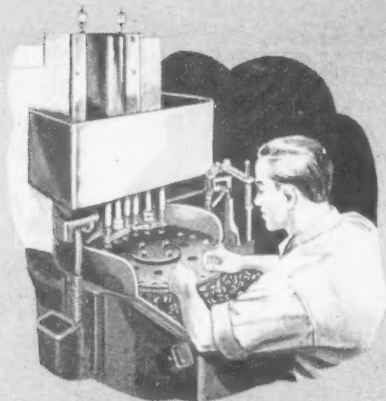
Double Reduction Speed Reducers. Bulletins Nos. 8962 and 8964 describing the manner in which standard single reduction Cone-Drive speed reducers are combined to provide double reduction units are available from the Cone-Drive Division, Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Bulletin No. 8962 covers speed reducers with 2½ and 3-inch center distance primaries and 4 to 7-inch center distance secondaries. Bulletin No. 8964 covers units with 4, 5, and 6-inch primaries and 7 to 12-inch secondaries.

Twist Drills and Reamers. A 48-page catalog on its recently introduced line of high speed twist drills and reamers has been issued by Charles H. Besly & Co., 118-124 N. Clinton St., Chicago 6, Ill. The catalog presents complete specifications and prices on all standard sizes and types of taper and straight shank regular three-fluted and four-fluted drills, as well as on hand and machine chucking reamers. A wide range of other popular and special-purpose drills and reamers is also covered in the catalog which is of pocket size for convenient use.



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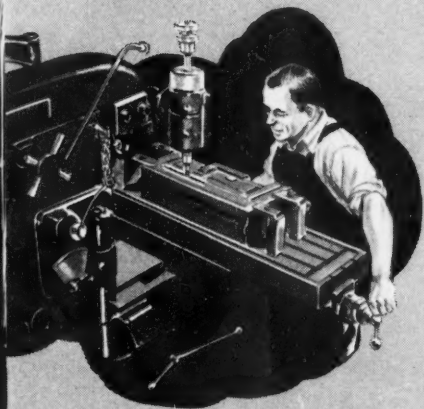


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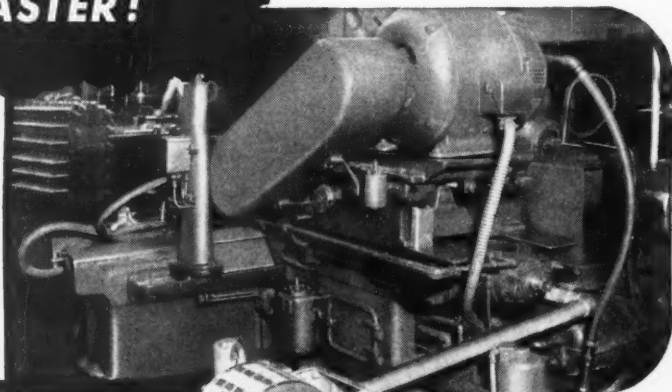
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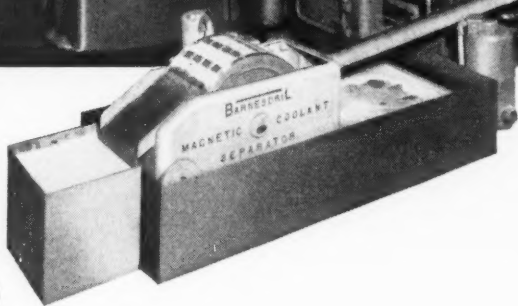
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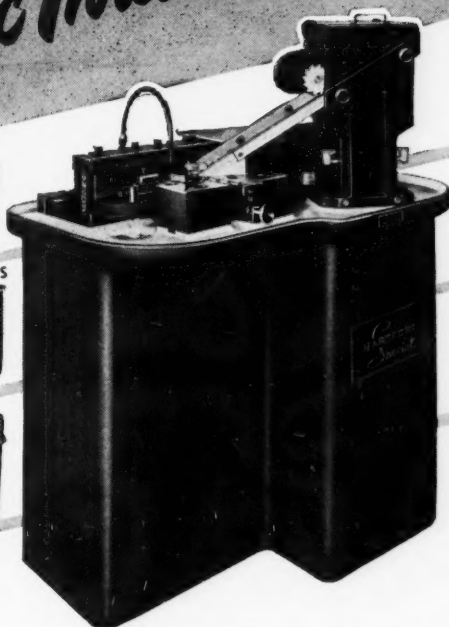
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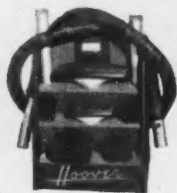
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Machining Operations

On

HOOVER Cleaners



By FRED W. VOGEL

High production of vacuum cleaners is maintained through use of efficient methods and machines.

OF all the many household appliances that have been designed to lighten the burden of the modern housewife, perhaps none has provided her with as much satisfaction as the vacuum cleaner. This satisfaction is due, in some measure, to the assurance that a modern cleaner will thoroughly and efficiently perform the job for which it was designed and, to an even greater degree, from the experience that a modern cleaner is so well constructed mechanically that many years of highly satisfactory operation are assured.

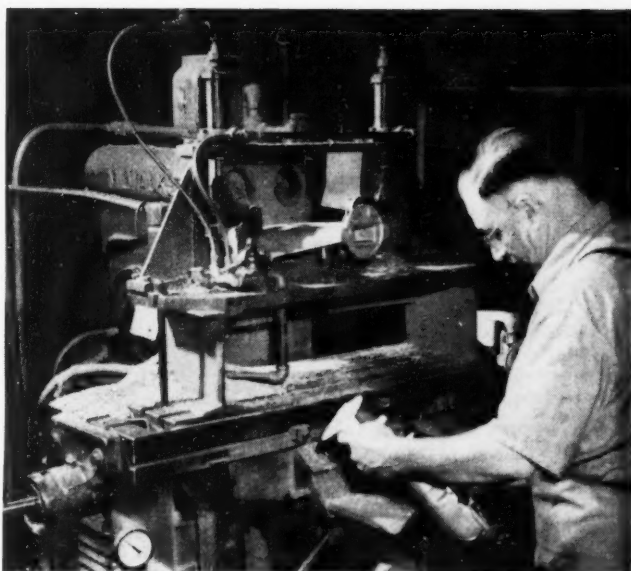
Ordinarily, little thought is given by the housewife to the mechanical operation of the cleaner so long as it continues to do a satisfactory job. Satisfactory mechanical operation is the responsibility of the design engineer and the production man in the factory whose never-ending tasks account for

the many improvements that are found in modern cleaners. Such responsibility rests upon the shoulders of the men employed in one of the largest plants in the world devoted exclusively to the manufacture of electric cleaners, The Hoover Company, of Canton, Ohio.

Probably better known than even the Hoover Company itself is the catchy slogan adopted some years ago and which spearheads the company's promotional campaigns—"It beats as it sweeps as it cleans." The thoroughness implied by that sales slogan is reflected no less in the machining operations required to produce the electric cleaners and accessories. Several of the more important operations are described in the following article.

The illustration Fig. 1 shows the milling of the agitator pocket of the main casting for the Model 28 upright cleaner. A rear view showing the cast-

Fig. 1—Main castings are positioned in specially designed holding fixture for milling agitator pocket.



ing in position in a specially designed air-operated clamping fixture and the milling cutters may be seen in Fig. 2. The casting is of aluminum and, for the milling operation, is securely held in an air-operated clamping fixture which is mounted on the milling machine table. Milling is done with the aid of

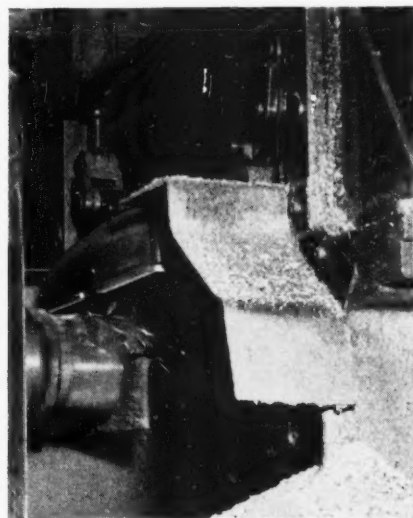
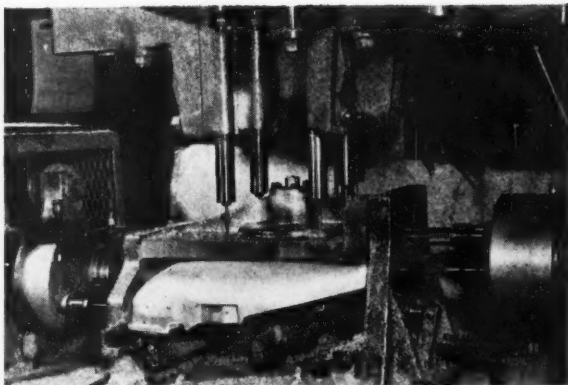


Fig. 2—Closeup view from rear of milling operation on agitator pocket.

spindle of a Milwaukee milling machine. One of the cutters is of the inserted carbide type and the other two are of high-speed steel. The carbide insert cutter is positioned on the spindle in such a manner as to provide for milling the $\frac{7}{16}$ inch by 12-inch surface of the agitator pocket while the HSS cutters provide for milling two side extensions of the agitator pocket which are 2 inches wide and $\frac{3}{16}$ inch thick.

Removal of the required amount of metal takes place in one pass beneath the cutters. After one pass, the table carrying the holding fixture automatically stops, an air valve lever is turned by the operator to unclamp the piece which may then be removed. A rough casting is inserted into the fixture and clamped, and the table once again traversed for milling in the opposite direction. The relatively short length of traverse enables the operator to easily load and unload the work in the clamping fixture without moving from one position. Operating at a

Fig. 3—Illustration showing multiple-spindle drilling operation of holes in main casting.



speed of 450 r.p.m. with a feed of 30 inches per minute, the cutters remove approximately $\frac{1}{8}$ -inch stock. Tolerance is held to ± 0.005 inch. Production on the main castings averages 100 parts per hour.

The operation shown in process in Fig. 3 is that of drilling 14 holes in the main casting. Of special design is the fixture in which the casting is located for the drilling of six holes at the top of the casting, five in the rear and three at the front. In order to hold the casting firmly in position for drilling, the casting is positioned on a framework to which is attached an air-oper-

ated cylinder. When the air valve is opened, a framework is moved upward and thus forces the casting against the underside of the fixture. Drilling then takes place as the drill-heads move in from the top and the two sides.

A Natco multiple-spindle drill is used to drill six holes in the underside of the casting and simultaneously tap the four motor case, two handle

bracket, and two furniture guard previously drilled holes. As shown in Fig. 4, the casting is held in an air-operated clamping fixture which is similar in design to that described for the drilling operation shown in Fig. 3.

One of the most interesting jobs in the Hoover shop consists of machining aluminum

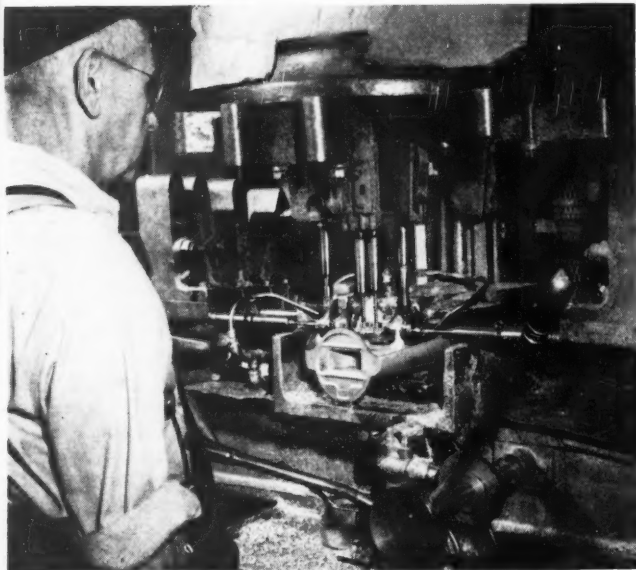
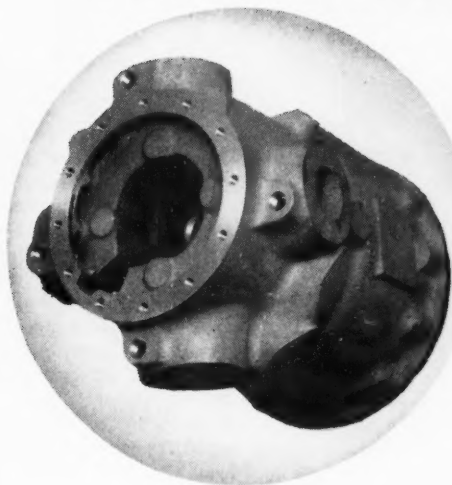


Fig. 4—Drilling holes in underneath side of main casting.

One a minute-

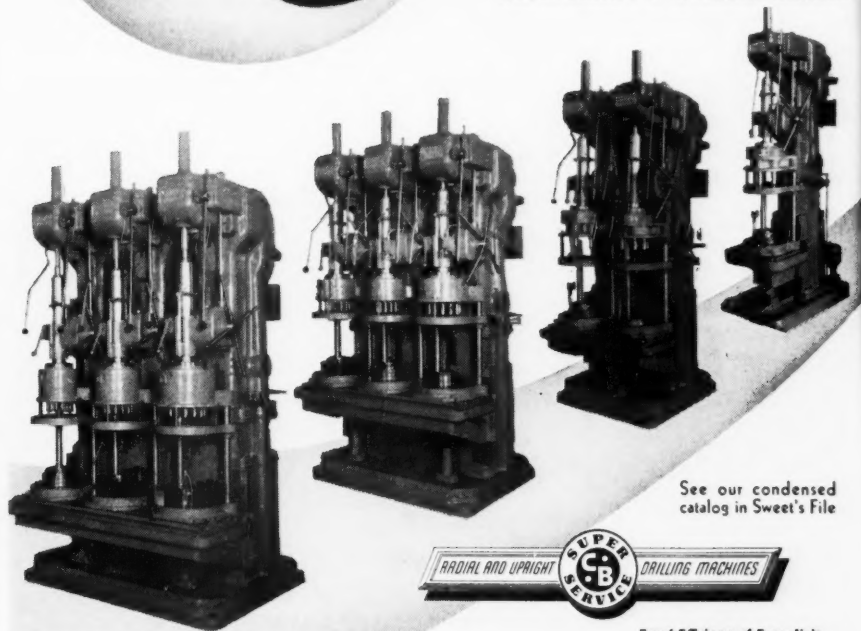


This battery of highly productive 21" and 24" Cincinnati Bickford Super Service Direct Drive Drills is drilling 24—.257" holes; tapping 24— $\frac{1}{8}$ " holes; step drilling 4— $\frac{1}{2}$ " x $\frac{1}{8}$ " diameter holes $1\frac{3}{8}$ " deep; tapping 4— $\frac{5}{8}$ " holes in this crank case housing.

The operations are performed on both ends of three sizes of castings. All operations are completed at the rate of one a minute.

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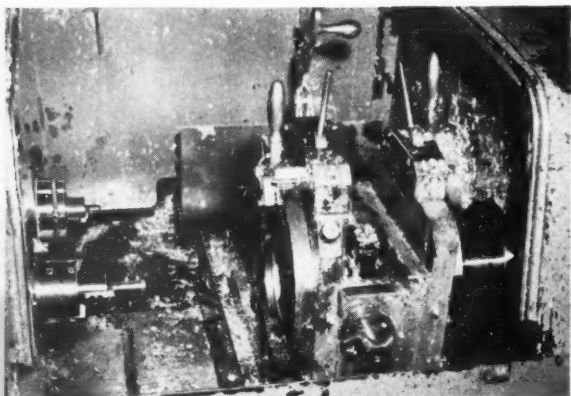


Fig. 5—View from front of Heald Double End Bore-Matic showing tooling at left.

motor housings and mating end covers for the Model 50 cylinder type cleaner in a Heald Double End Bore-Matic. This precision finishing machine provides the means for entirely finishing the mating members—motor casing and end parts—in one cycle.

The fully automatic machine cycle, a contributing factor in efficient production is set in operation by push button control after the work is loaded. The table travels first to the left; boring stations 1 and 2; operations completed, the table rapid traverses auto-

In stations 1 and 2 shown in Figs. 5 and 6, fourteen finishing operations are performed on two motor casings, while in station 3 shown in Fig. 7 the end plate has five surfaces finish bORIZED.

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Cutters — B-C Tantung-Tipped Slab Mills, $4\frac{1}{2}$ " x 4" x $1\frac{1}{2}$ "

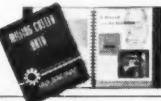
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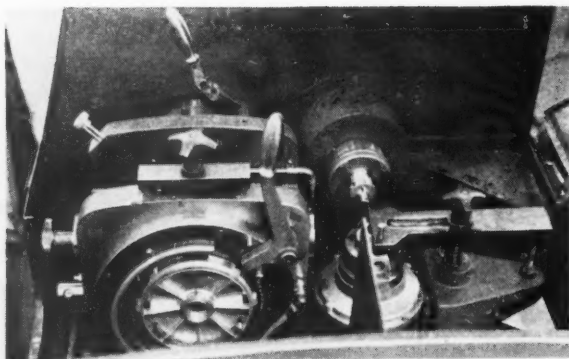
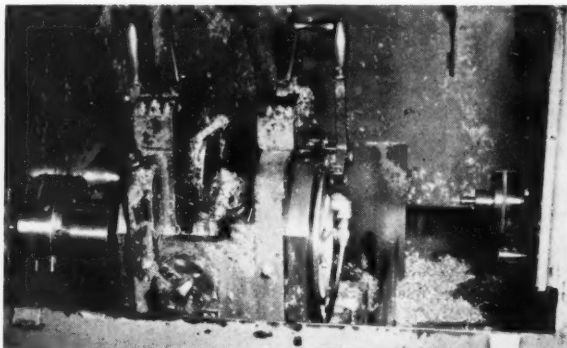


Fig. 6—Station 2 of Heald Double End Bore-Matic is shown at right.

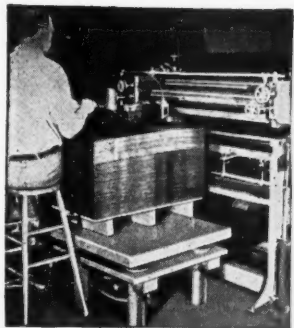
matically to the right, borizes station 3 and returns to the centerstop position. At this point a finished motor casing and a perfectly mating end plate are removed from stations 2 and 3 respectively thereby accomplishing the desired balanced production and at the same time elimination of selective assembly. The cycle being complete, the motor casing in station 1 is loaded in station 2, station 1 and 3 are reloaded and the cycle is repeated.



No. 7—Tooling of station 3 is shown at right.

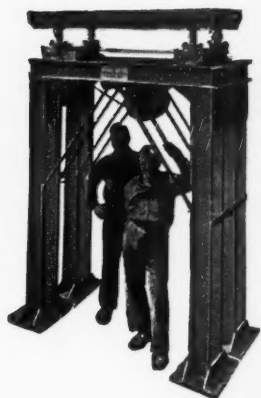
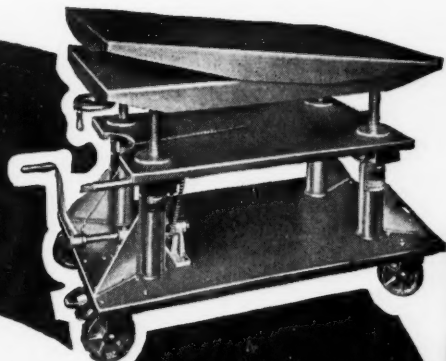
Unit Type Dust Collectors. A 36-page catalog and price list of unit type "Dustkop" dust collectors released by the Agat-Detroit Co., 207 Main at Washington Sts., Ann Arbor, Mich., contains specifications and information on entirely new models and improved models, as well as illustrations of applications of Dustkops on grinding, buffing, polishing, sanding, and other dust-creating operations. A separate section is devoted to vapor collectors which are used to collect mist and vapor from thread grinding, screw machining, centerless grinding, and other operations.

"Design for Resistance Welding" is the title of a 32-page booklet explaining and illustrating advanced techniques in the resistance welding processes which has been prepared by The Resistance Welding Institute, Hartman Bldg., Detroit Ave. at Warren Rd., Cleveland 7, Ohio. The booklet, which covers the theory and application of spot welding, seam welding, projection welding, and butt welding, is liberally illustrated with 61 drawings and photographs and contains 11 helpful tables for the guidance of resistance welding users.



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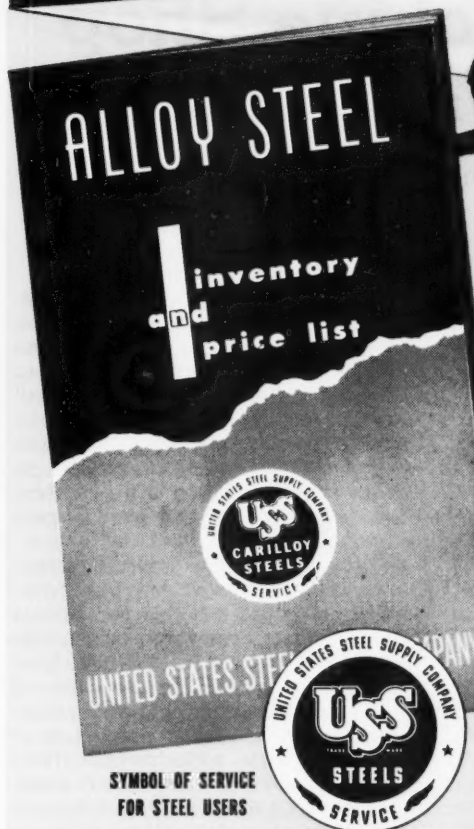
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UNITED STATES STEEL

Handy Quality Control for the Machine Shop *

In this article the author illustrates and describes the standard deviation—frequency distribution quality control technique.

By CLIFFORD W. KENNEDY
Quality Control Engineer

ONE OF THE manufacturing fundamentals rejuvenated when modern quality control techniques are practiced is the fact that the machine, methods, tooling or process must be capable in themselves of producing within the required specifications. It is deceptively easy for a draftsman to indicate tolerances on the blue print of a part and for the production control office, or even the foreman of the department, to assign particular operations on that part to a certain available machine without considering the inherent capability of the machine itself to perform within those tolerances. Soon inspection goes on a rampage and begins to reject the work and the operator (too many times perhaps) gets blamed for not knowing how to do his job.

There is also frequently the circumstance where the trade demands certain tolerances and precisions in products and where the boss for reasons

of his own never gets around to replacing a twice amortized machine or, somehow, just the convenient time can never be found to jerk the machine out of the line for overhauling. When business is good the machine can't be spared; when business is dull repairs or replacement can't be afforded. So the shop files or stones a little, tightens down or shims up, and loads the gear box with stringier grease.

Where time study systems, standards and operating cycles are the fashion, the intrinsic machine capabilities are too seldom considered. A machine many times may be held in line from producing out-of-tolerance work if the operator's production cycle allows properly for the required and more or less continuous adjustments. Total pieces per hour is not necessarily something to brag about; net in-tolerance work is what satisfies the customers and pays the bills in the long run.

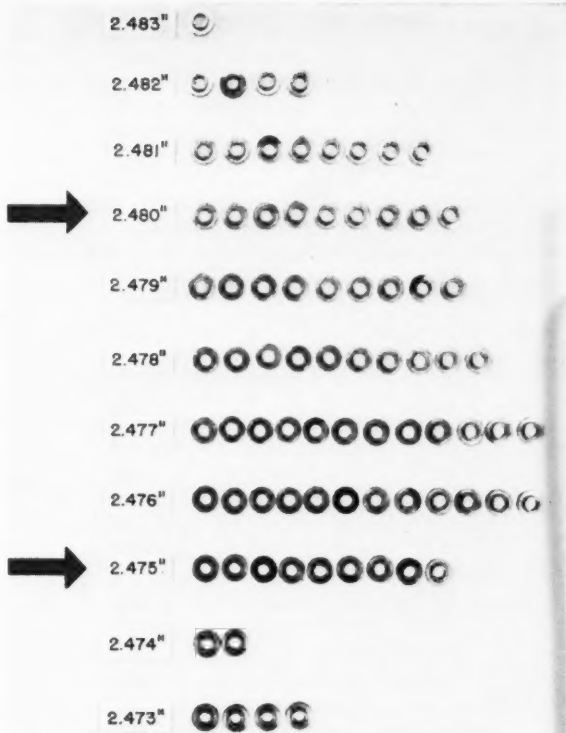
Intrinsic machine capability is to be differentiated from, shall we say, operation capability for producing in-tolerance work. Of course there are many routine things the operator does of necessity at a machine to prevent production of oversize work and scrap.

* An article by Mr. Kennedy titled Handy Quality Control for the Machine Shop appeared in the August 1949 issue of MODERN MACHINE SHOP. In presenting this succeeding article it is presumed that the earlier treatment has not only been read but that interest or curiosity has been developed sufficiently to make the present article valuable.

Fig. 1—Illustration showing a method of graphically portraying the condition of output in regard to tolerances from a machine designed to bore the diameter of a ring-shaped workpiece.

The tool must be sharp, the wheel dressed often enough; every adjustment, stop, cam and the like tightened down properly. The cutting speeds must properly relate to the size of the work and the type of metal being removed. The skillful operator, tool setter and foreman will recognize all such hazards of course and meet them. But then there can still remain the barrier to satisfactory work which may not be so readily bridged, if at all: the condition of the machine itself.

The article titled Handy Quality Control for the Machine Shop appearing in the August 1949 issue of Modern Machine Shop described graphic methods for displaying the pattern of work produced on a machine. A plot or so-called frequency distribution chart was illustrated. Another similar way the quality control engineer occasionally makes graphic the condition of output in regard to tolerances is illustrated in Figure 1. In this case the hole or bore diameters of the ring-shaped pieces were under study. As the I.D. of each piece was measured it was placed in the proper row or classification marked by the cards on the bench top and, after an hour, as some eighty pieces poured from the machine, the machine's "pattern" appeared in the



arrangement of pieces falling into selected rows by dimensional steps. The relationship between the hour's work and the I.D. specifications has been emphasized by marking two tolerance limit lines on the photograph of Figure 1.

Nearly a third of this hour's work was out of tolerance—most of it on the high side, and improperly in the case of hole sizes because oversize holes are scrap. A little of the out-of-tolerance work was undersize—rework in other words.

The pattern produced in Figure 1 does not tell, of course, how much of the trouble may be due to varying degrees of operator inattention, neglect or lack of skill or how much of it should be assigned to intrinsic troubles

in the machine or tool. One object of this discussion is to explain a quality control technique and a trifle of arithmetic that will help place the proper share of blame on the machine, tool or process itself—the degree of product inaccuracy a conscientious operator cannot fend off.

During the course of measuring the eighty pieces for the "pattern" shown in Figure 1 a special note was made on

What we have, in mathematical parlance, in this left hand column of Figure 2 is a set of "variables"—a set of measurements or observations varying somewhat among themselves. Continuing for a second or two more to speak in mathematical jargon, when you have a set of variables you can find the "standard deviation" of them. You have probably heard engineers speak of practically the same thing as "root-

| Measurements | X | (X - \bar{X}) | (X - \bar{X}) ² | |
|------------------------------|--------------------------|------------------|-------------------------------|------------------|
| 2.478" | 8 | 1 | 1 | |
| 2.477 | 7 | 0 | 0 | |
| 2.481 | 11 | 4 | 16 | $s = \sqrt{2.5}$ |
| 2.478 | 8 | 1 | 1 | $= 1.6$ |
| 2.475 | 5 | -2 | 4 | $= .0016"$ |
| 2.478 | 8 | 1 | 1 | |
| 2.477 | 7 | 0 | 0 | |
| 2.476 | 6 | -1 | 1 | |
| 2.477 | 7 | 0 | 0 | |
| 2.476 | 6 | -1 | 1 | |
| <u>24.773</u> | <u>73</u> | | <u>25</u> | |
| $\frac{24.773}{10} = 2.4773$ | $\frac{73}{10} = 7.3$ | | $\frac{25}{10} = 2.5$ | |
| or 2.477" | Call \bar{X} 7 (.007") | | | |

Fig. 2—Chart illustrating mathematical computations required to determine standard deviation of work being produced.

a piece of paper of the I.D. dimensions of ten more or less random pieces. Only one qualification was required of this otherwise random, smaller sample. It represented a portion of the hour's work, a definite and somewhat short period of production, in which the operator himself made no change in the adjustment of the machine. The tools had just been properly sharpened so that the effect of a dull tool could be disregarded. The actual measurements from the actual pieces, in the order they were secured and penciled down, are shown in Figure 2, the left hand column.

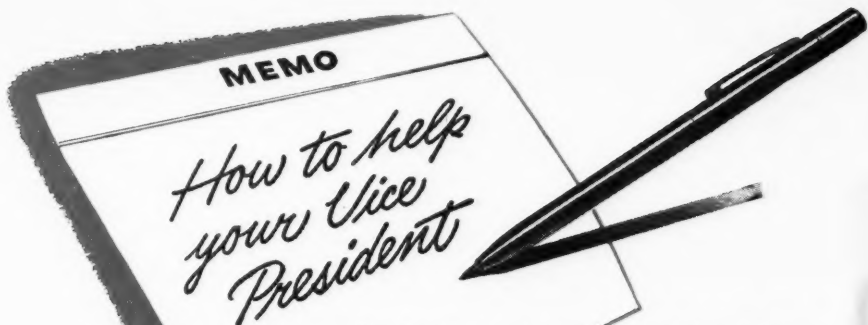
mean-square." When a standard deviation, frequently symbolized by the letter s in formulas, is known or computed, quite a little of practical value can be done with it as will be seen shortly.

The basic formula for the standard

deviation is, $s = \sqrt{\frac{\sum (X - \bar{X})^2}{n}}$ Don't

get scared. All this can be put in layman's language and arithmetic in a minute.

The X of the formula means any of the readings, observations or measurements taken to make a set of variables.



eliminate secondary operations

Excessive rehandling costs can force you out of a market—no one knows that better than your vice president in charge of manufacturing.

He knows, too, that the one best way to reduce part costs is to do more operations before the work leaves the automatics. But does he know that the most recent developments in tooling the new Acme-Gridley automatics often eliminate not only one but two and three rehandlings?

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MATERIAL—B-1112 Steel

MACHINE— $1\frac{1}{4}$ " RA 6 Spindle Acme-Gridley Bar Automatic

OPERATIONS—13, including shave large thread diameter, and roll thread, mill flats or large diameter, die cut thread and mill keyway on small end

MACHINING TIME—15 seconds, complete



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| Weights of packages | $(X - \bar{X})$ | $(X - \bar{X})^2$ |
|---------------------------|-----------------|-------------------|
| 14 | 3 | 9 |
| 16 | -1 | 1 |
| 18 | 1 | 1 |
| 18 | 1 | 1 |
| 15 | -2 | 4 |
| 19 | 2 | 4 |
| 17 | 0 | 0 |
| 18 | 1 | 1 |
| 19 | 2 | 4 |
| 15 | -2 | 4 |
| 10 169 | | 10 29 |
| 16.9 | | 2.9 |
| say, $17 = \bar{X}$ | | |

Fig. 3 — Chart illustrating method of determining a standard deviation from ten samples.

$$\sqrt{2.9} = 1.7$$

$$3 \times 1.7 = 5.1 - \text{say, } 5$$

$$17 \pm 5 = 12 \text{ \& } 22$$

practical average, 7, from each \bar{X} , all of which appears in the $(X - \bar{X})$ column of Figure 2. Furthermore we are to square the $(X - \bar{X})$'s, an oper-

The \bar{X} (barred X) of the formula stands for the average of the readings or variables. The Greek letter Σ betokens sum or summation of. In other words, subtract the average (\bar{X}) from each individual reading, says the formula, square each of these subtractions, and then add up all the squared subtractions. The n of the formula of course means the number of pieces, the sample size.

The left hand column of Figure 2 shows where we have added up all ten measurements and divided by ten in order to get the average measurement (\bar{X}) of the group—2.4773" or, practically, 2.477".

However, adding ten 4 digit figures is a lot of arithmetic. And unnecessary. To get s we need use only the last digit of each recorded measurement and these last digits are listed down in Figure 2 under the heading of X . At the bottom of the X column we have added up and divided by 10 to get the average (\bar{X}) of 7.3 and, to simplify the arithmetic further, the unnecessary extra decimal is cut off, leaving a practical \bar{X} of 7. (As Figure 2 indicates, this \bar{X} of 7 corresponds to .007" or to 2.477".)

The next step is to subtract this

tion appearing in the $(X - \bar{X})^2$ column in Figure 2.

The standard deviation formula says summation (Σ), add up, and then divide by n . So, in Figure 2, we have added up the $(X - \bar{X})^2$ column, getting 25 as an answer, and divided by 10—the n or sample size—for the 2.5 result. As a final step we take the square root of 2.5 for the s of 1.6. Figure 2 translates 1.6 back into .0016".

In other words the standard deviation of the varying sort of work our machine was putting out was .0016". Having ferreted out all this arithmetic* and calculated the standard deviation, of what practical use is it?

Simply this. If six standard deviations exceed the specifications or the tolerance spread, the machine is bound to make scrap or rework—even though the operator maintains his setting exactly on the mean—until the mechanical cause of the variations is discovered and corrected. In our example

* Anyone who will once actually perform the arithmetic exercise illustrated in Figure 2, which can be done in much less time than it takes to smoke a cigarette, should be no longer bothered about getting a standard deviation and the detailed description in the paragraphs above will be absurdly clear. Unfortunately even the simplest description of any arithmetic cannot be made to read as easily as pulp magazine fiction.

Courtesy Hycore Arms Co., Brooklyn, N.Y.



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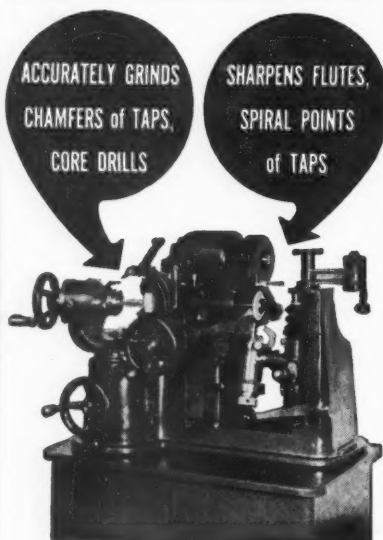
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the tolerance spread—2.475" to 2.480" as shown in Figure 1—is .005". Six times the standard deviation of that machine—6 x .0016"—is .0096" or, practically, .010".

Hence, calculating the standard deviation of the variable type work the machine is producing, and comparing six* of these standard deviations with the specification, we find that the so-called natural variation of the machine's accuracy is just about twice what it ought to be for the purpose, and the operator is licked. (Where six standard deviations is exactly equal to the tolerances an operator can just barely keep away from scrap and rework by holding his cutting adjustments squarely on the specification mean. An economically ideal relationship, it has been found from experience, is where six standard deviations is two-thirds to three-quarters of the tolerance spread.)

Remember the random sample of ten pieces was secured at a period in the operation of the machine during which the operator made no adjustments and just after the tool had been freshly sharpened and set for the tolerance mean. In spite of the operator's care and setup skill, then, the machine put out defective material. The "pattern" of Figure 1 confirms this. Run-out, deflection, loose ways, vibration, worn bearings—any good machine maintenance mechanic should know what to look for when six standard deviations give the signal the machine itself is causing the out-of-tolerance work.

Figure 3 illustrates another practical example of the use of six standard deviations in analyzing trouble. A package filling machine was tested by weighing the contents of ten packages

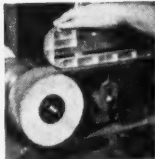
*Anyone who might be interested in pursuing further the mathematical theory underlying this article is referred to *Quality Control Methods*, C. W. Kennedy, Prentice-Hall, New York. A bibliography in the book indicates also additional and advanced treatments of the subject.



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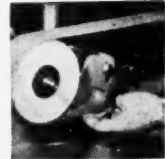
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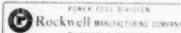
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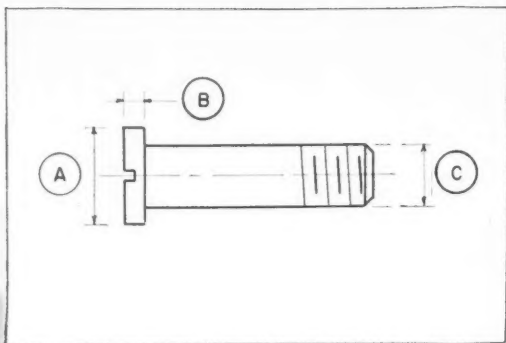


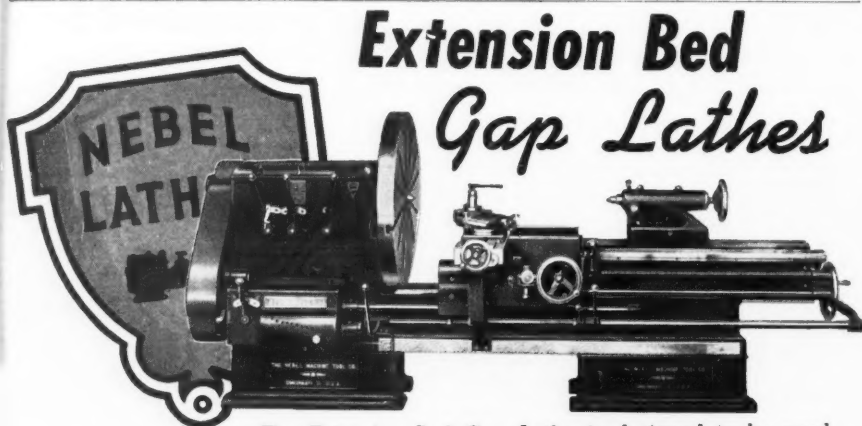
Fig. 4—Sketch of special stud on which lettered dimensions were required to be held within tolerance limits of .002".

taken at random from the conveyor line leading away from the automatic machine. The ten weights appear in the X column of Figure 3.

This manufacturer intended to give the customer 16 ounces, one pound, in each package. Furthermore he intended, properly, to give a little overweight in each package. As Figure 3 shows, the 10 sample packages averaged 17

ounces (\bar{X}) and, if the investigating engineer had reported simply this average, probably everybody would have been reasonably satisfied that the machine was adjusted and operating properly.

But this engineer decided to calculate the standard deviation of variability of the machine which proved to be, as Figure 3 indicates, 1.7 ounces. Hence, he reasoned, if the machine is set for a mean of 17 ounces and if the six standard deviations of practically 10 ounces is split half and half about this mean, then the machine is really capable of filling some packages up to



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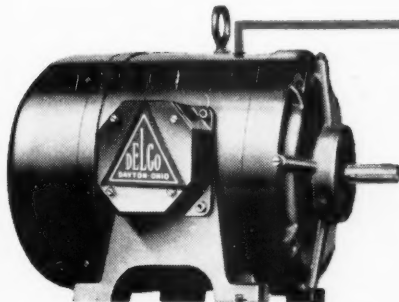
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17 plus 5 ounces, or 22 ounces, and of "cheating" to the tune of 17 minus 5 or 12 ounces. Opening about a hundred packages and weighing the contents proved his contention—a few packages were very "light," others were as "heavy," and the output of the machine varied continually between 12 ounce and 22 ounce packages. Suitable machine repairs, the design and installation of more accurate control mechanisms and closer supervision of the machine's adjustment from then on saved the customer from being cheated and the manufacturer from unnecessarily high "overweight" losses.

Thus far the suggestion has been made that a so-called standard deviation be determined from a sample of ten units. This was done in order to make the explanation of the arithmetic involved simpler to understand. It is known, of course, that the larger the sample the more accurate will be the

estimate or analysis obtained from it. It has been found that, for ordinary machine capability study, the random sample should not usually be smaller than twenty pieces or units but that it seldom needs to be larger than fifty pieces. Attempt, as has also been suggested, to secure a random sample from work that is run soon after the operator has tried to set his machine satisfactorily for the mean dimension and after the tool has been freshly sharpened or the wheel dressed. In other words, be sure the sample does not contain pieces from two different machine adjustments or from combinations of sharp and dull tool production or any other possible direct operator influence.

It is essential for a reliable analysis that the measurement on each piece be made with considerable care and accuracy. The gage or measuring instrument must have a "discrimination" equal at least to one-fifth the

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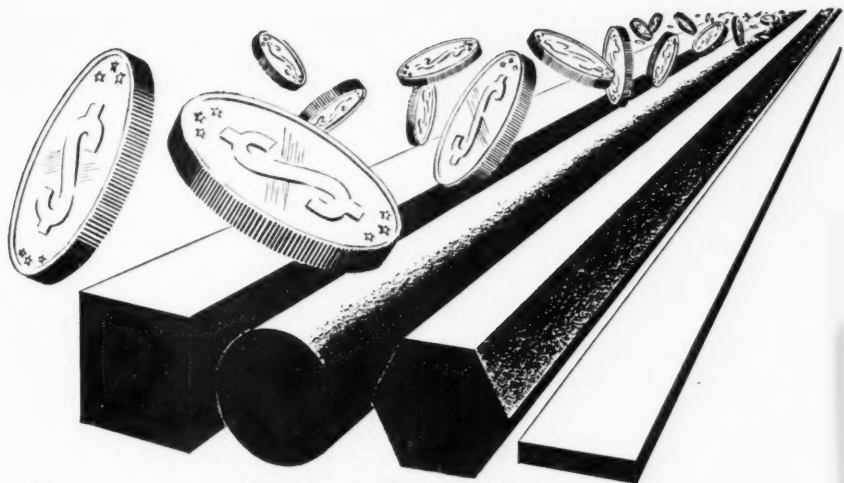
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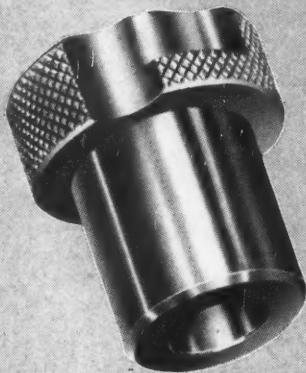
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tolerance spread or perhaps, better, be able to register one-tenth of the specification. Where out of round or ovality is encountered the measurements are consistently taken on the greatest diameter of the out of round of each piece where O.D.'s are concerned and on the smallest diameter where I.D.'s are being measured.

In the ordinary situation a machine may be in use on work of one type or size of part one day or week and on another setup the following week. It is safer not to reach a final conclusion to overhaul or obsolete a machine until the standard deviation test has been made on the production of several different components. A machine, of course, will usually give a different response to brass, stainless steel and to various grades of machine or tool steel. Practical judgment concerning all such factors must be added to the "statistic" provided by the actual standard deviation.

Our screw machine shop studies of the type just described were made originally on a battery of 00 Brown and Sharpe machines and on Peterman Swiss type machines. As a result, several machines were taken out of the line for thorough overhauling. But the most practical result from a few days, scattered over a variety of production, of measuring sample pieces and calculating six standard deviations was the classification of information for production control purposes.

Probably because of innate peculiarities in the machines themselves, even though they were judged to be in good mechanical shape, the production of certain types of components proved to be more accurate in certain machines than in others. The production load was consequently distributed among the several supposedly exactly similar machines in the battery in accordance with the type of capability findings just disclosed.

A rather typical example came up in the sort of small special screw or

stud illustrated in Figure 4 where dimensions **A**, **B**, and **C** all had to be held, according to engineering blue prints, to tolerance limits or spreads of .002". In a sense this piece was used as a guinea pig. Batches of these components were produced for a while in one machine and then the setup was shifted to the next machine in the line, and so on.

Aside from the machines which were obviously in need of overhauling, it was found that all the machines could hold within .002" tolerances on the screw head diameter—dimension **A** in Figure 4—but that only one or two succeeded with the head thickness or length dimension **B** in Figure 4. None of our equipment at the time could satisfactorily hold to a .002" tolerance on the stud body diameter, **C** in Figure 4, no matter what devices in tooling were hurriedly tried nor how much the operator "nagged" the machine. So a temporary blue print change was ordered, increasing the tolerance to .004". Subsequent studies at assembly, where the stud of Figure 4 was eventually used, and in end product tests, showed that the original rather severe specification of .002" was unnecessary and our screw machine shop was spared the task and expense of devising new tools or screw machine attachments or of rearranging its production time standards.

All of which points up another dividend that can be collected from a little time spent analyzing machine capability with the use of the standard deviation. Usually the first step taken, when six standard deviations exceed the tolerance spread, is to investigate the need for repairing the machine. But then the second step should be to question the validity of the specification. Many times a "pattern" plot of a sample, plus the mathematical confirmation of the six standard deviations calculation, will stir the engineering department into allowing more obtainable tolerances.

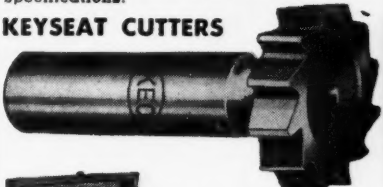


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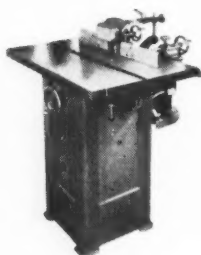
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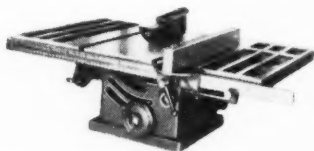
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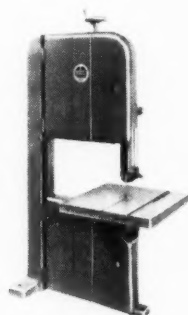
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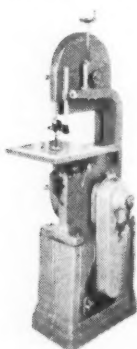
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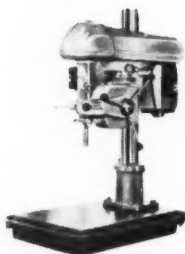
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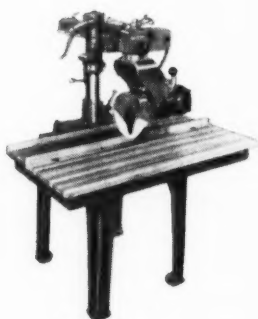
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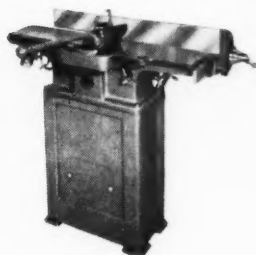


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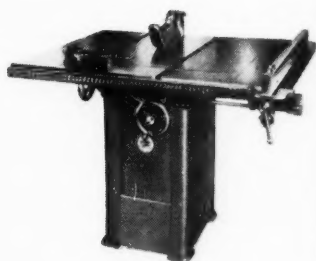
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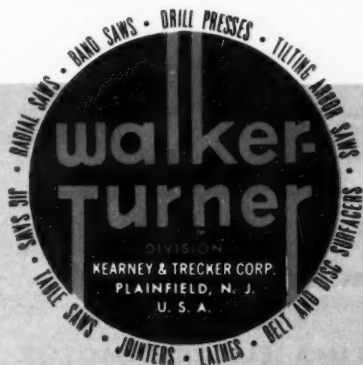
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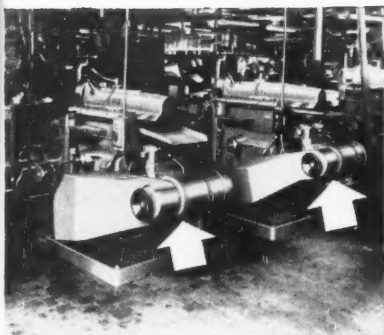
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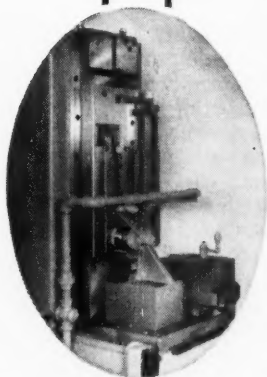
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Induction Hardening, Part II

A discussion of the steels which are best adapted to the induction hardening process, proper methods of quenching induction heated workpieces, and progressive hardening.

By FRANK W. CURTIS

STEELS which are used for induction hardening may vary widely in their metallurgical specifications and may be either of the oil, water, or air hardening types. It is essential, however, that the carbon content of the steels be at least 0.40 per cent, or even 0.45 per cent, in order to assure a wide enough latitude in hardness. Steels having carbon contents in this range or higher respond well to induction hardening treatment and, as a rule, provide hardnesses up to 60 Rock-

well C or higher. When a choice exists of using either an oil or a water hardening steel, it is much better to use the water hardening steel, especially when a spray quench is to be applied, because of the more favorable quenching conditions.

In most grades of quenching steels which are suited to induction heat treatment, carbon solution takes place at an exceptionally fast rate. Experimentation with a sample of plain carbon steel having a carbon content of

0.45-0.50 per cent which was heated to 1,550 deg. F. for less than one second has shown that the solution of carbon is complete in this short period of time, thus producing satisfactory hardness properties. Some grades of steel, however, particularly

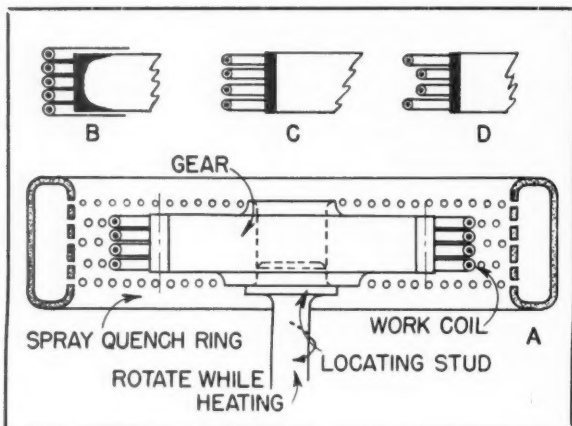
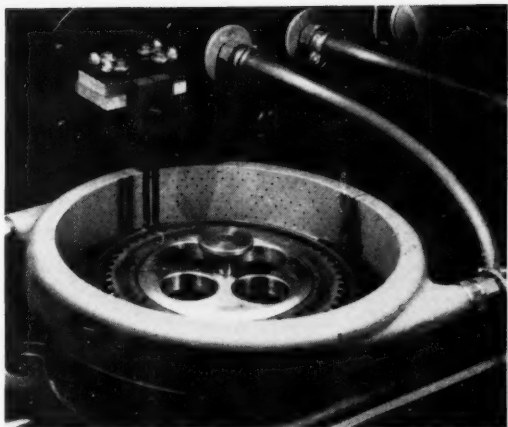


Fig. 1 — Sketch of a typical spray quench fixture used for hardening spur gears.

Fig. 2—The equipment for hardening the teeth of this sprocket includes automatic heating and quenching cycles.
(Courtesy Induction Heating Corp.)



those of the air hardening type, do not respond quite as rapidly so that a slightly longer period of heat may be required in order to provide correct carbon diffusion. With some air hardening type steels, if it is desired to produce a shallow case depth, the induction treatment is often obtained by using two separate heatings.

A hardening treatment by induction heating sometimes serves as an influencing factor in the selection of the type of steel which is used for a given part, and it often permits the substitution of a plain carbon steel for an alloy steel. Indications have shown that a free machining, standard carbon steel, such as C-1144, may be used successfully for a wide variety of parts, especially in cases where hardness to resist wear is essential, and that the use of alloy steels may therefore be reduced materially, thus reducing the number of grades which must normally be carried in stock. Both plain carbon steels and alloy steels, when hardened and drawn to the same degree of hardness, will have equal tensile strength qualities. The plain carbon steels may be obtained at a lower cost, and usually may be machined more economically than alloy steels.

The hardening of steel and cast iron depends upon the solution of carbides and upon the diffusion of carbon and alloying elements from these carbides into the mass of the steel. The rate of diffusion of carbon is relatively fast. The rate of diffusion of alloying ele-

ments is comparatively slow. These diffusion rates are a function of both temperature and time; at a low temperature, a rather long period of time is required for proper diffusion, while at a higher temperature, less time is required.

Since the method of induction hardening involves relatively rapid heating rates and short heating times, it is sometimes necessary to use higher temperatures than would ordinarily be used in furnace heating. Inasmuch as the diffusion of carbon is rapid under any circumstances, plain carbon steels need not be heated to temperatures which are much above standard furnace hardening temperatures. On the other hand, for some alloy steels, temperatures which are 50-100 deg. F. higher than furnace temperatures may be required in order to increase the diffusion rates of the alloying elements because they are sluggish in their metallurgical response to heating.

The temperature required for the satisfactory induction hardening of an alloy steel depends upon the following factors:

1. The amount of alloying agent or agents. As the amounts of alloying agents are increased, higher temperatures are required.

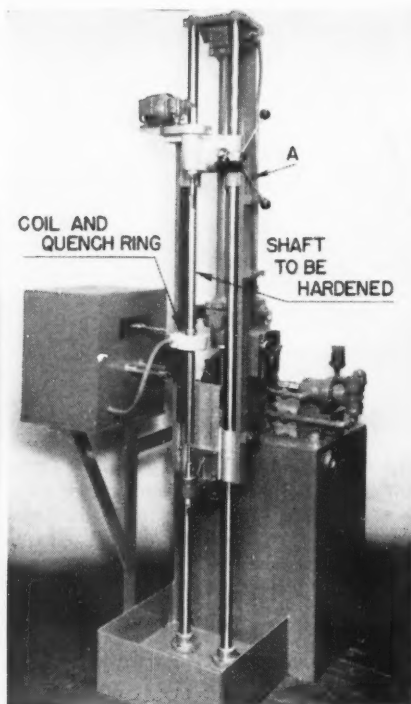


Fig. 3—A progressive feed unit used for hardening steel shafts up to approximately three feet in length.

Heat resistant stainless steels, air hardening steels, and cast irons are more sluggish than any of the types of steels listed above. In some cases, it is difficult to obtain maximum hardness values for these steels by using induction heat, but in most cases it is possible to come within a point or two of Rockwell-C values of the maximum hardness attainable. Obviously, production rates which may be obtained when heating alloy steels are somewhat lower than those obtained for plain carbon steels because of the higher temperatures which are required.

In using induction heating for the localized hardening of gear and sprocket teeth, either of two basic methods of quenching may be applied. One method is to follow the heating period by an immersion quench in a tank; the other is to use a spray quench after the part has been heated in the heating coil. The choice of methods depends largely upon the specifications of the piece to be heated, and sometimes the choice can be made only after both methods have been thoroughly analyzed and tested.

If immersion quenching is selected, a variety of equipment may be used. Some of the equipment is made to be semi-automatic, while other equipment works best if manual controls are used. Parts may be suspended into a space inside an induction coil by means of electromagnets, which then release the parts after they have been subjected to a predetermined heat cycle. Solenoid-operated trips and releases may also be utilized in connection with automatic timers, dropping the workpieces into a quench tank after they have been heated.

It is often possible to obtain a de-

2. The length of the heating cycle. The faster the heating cycle, the higher is the temperature required.
3. The previous treatment and as-received condition of the steel. For example, a steel received in a soft annealed condition necessitates a relatively high hardening temperature. The higher the original hardness of the steel, the lower is the hardening temperature which is required for that particular steel.

The response to induction hardening of various types of SAE and AISI steels may be listed as follows:

| Response | SAE and AISI Series Numbers |
|-----------|--|
| Excellent | 1000, 1100, 1300, 2000, 2100, 2300, 2500 |
| Good | 3100, 4600, 4800, 9400 |
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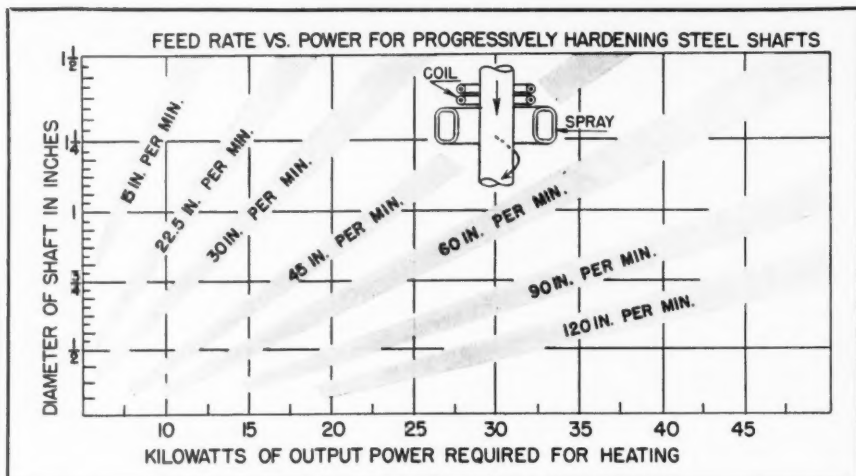


Fig. 4—The rate of feed which may be used for progressively hardening a steel shaft depends upon the diameter of the shaft and the power available.

sired, specific hardness more effectively if spray quenching is used than if another method is selected. This is due to the fact that a slight variation of the heating and/or quenching times will cause the hardness readings on a given surface to vary proportionately. With spray quenching, these times may be controlled quite closely; whereas with immersion quenching, this close control is not always possible, and it is sometimes necessary to re-treat a part in order to obtain a desired hardness value.

Assume that it is desired to harden

the teeth of a steel gear having a three inch diameter and a 0.50 per cent carbon content. A hardness value of 60 Rockwell-C may be obtained by applying a normal heating cycle followed by a suitable period for quenching. If, however, a hardness value of only 55 Rockwell-C is desired, the duration of quench may be reduced proportionately in order to obtain this required hardness. The part is not cooled thoroughly so that the heat which remains substitutes for the heat of a subsequent drawing operation.

A typical spray quench fixture used

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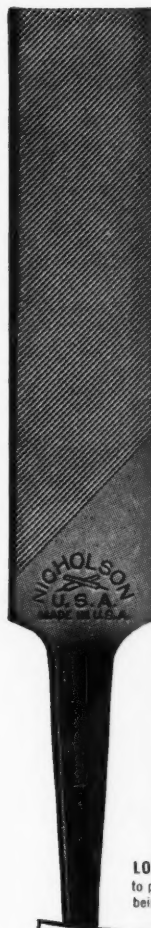
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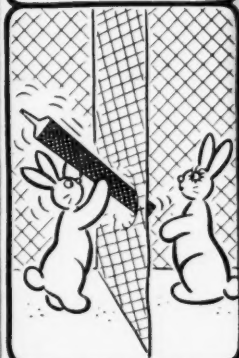
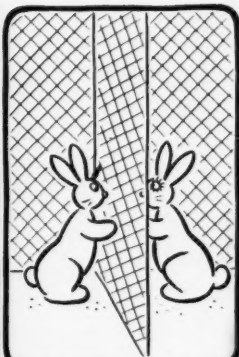
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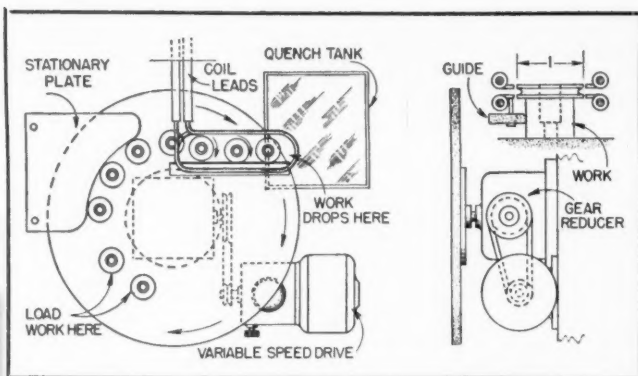


Fig. 5—Drawing of a rotary table unit for progressively feeding parts through a heating coil.

for hardening a spur gear is sketched at A in Fig. 1. The gear is mounted on a locating stud which, in turn, is fitted into a spindle. Preferably, the spindle should be power driven, and it should be rotated during the heating portion of the cycle at about 75 r.p.m. Rotation is used to assure a more uniform heat pattern and to compensate

spray quench ring. The passage of water for the quenching operation is controlled by means of a timer which actuates a solenoid-operated valve, normally closed. The turns of the coil should be flattened, and they should be wound so that the impinging spray may be passed through to the heated area of the gear.

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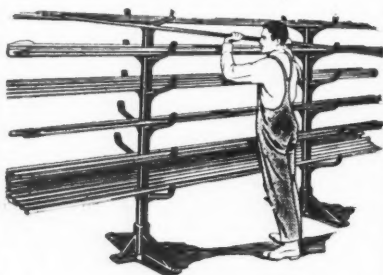
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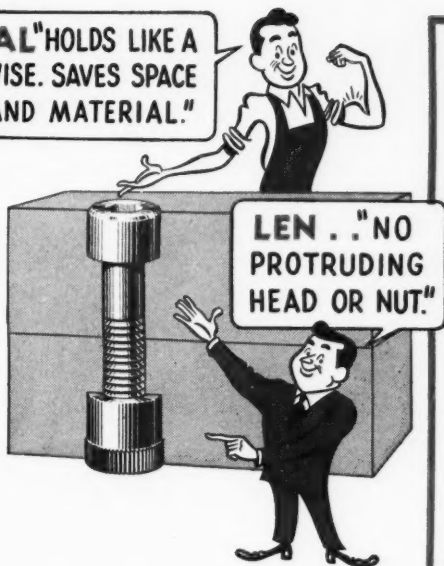
In the hardening of gear teeth, it is necessary to consider the height of the heating coil with respect to the face width of the teeth. When the heating coil is of a greater height than the face width, as in Fig. 1 at B, there is a tendency for the top and bottom surfaces of the gear blank to absorb an excessive amount of heat, as shown. If a coil having a height which is slightly less than the face width of the teeth is used, as at C, the heat pattern will be more evenly distributed.

When using a single-turn coil for gear hardening, it is possible to make the height of the coil initially equal to the face width of the teeth and then, after a number of trials, to trim the coil down in order to obtain a proper heat pattern. With a multi-turn coil, however, it may be necessary to provide one turn less or, perhaps, to alter the spacings of the coil turns after observing the results of the trial runs. Another method by which a heat pattern may be made more uniform is to wind a multi-turn coil so that the inside turns are closer to the gear than the outer turns, as at D, in Fig. 1.

In Fig. 2 is illustrated a typical spray quench heating setup for hardening the teeth of a sprocket. A single-turn coil is used for heating, followed by a spray quench which "floods" the sprocket from both sides. Heating and quenching are controlled automatically by means of a sequence timer.

In the induction hardening of gears, it is necessary to consider residual stresses which normally occur when steel is heated to hardening temperatures, especially in cases where dimensional changes may be objectionable. As a rule, gears are stress relieved prior to the cutting of the gear teeth as a means of reducing dimensional changes in cases where close limits are required. Because such dimensional changes may also be present as a result of uniform heat application, they should be compensated for by the use

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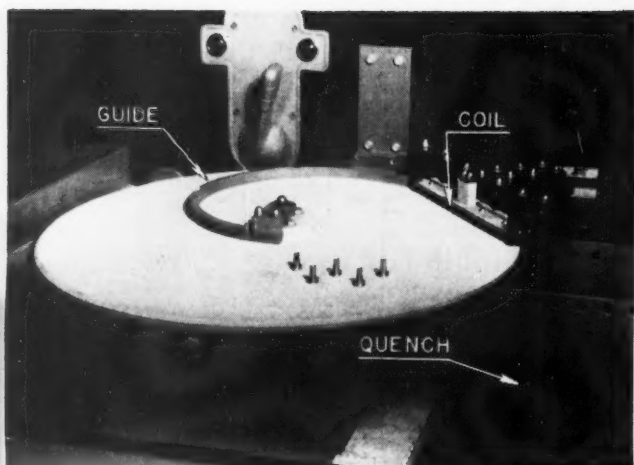


Fig. 6 — After screws are fed through the coil on this rotary table unit, they are dropped into a quench tank.
(Courtesy Induction Heating Corp.)

inch of gear blank diameter. Usually the gears may be remachined quite easily due to the fact that no metallurgical changes take place.

of appropriate machining tolerances. Suitable tolerance factors are particularly advisable in cases where there is no subsequent machining or finishing of the gear teeth after the hardening operations.

The shrinkage of a bore in a gear will vary with respect to web dimensions, or the distance from the gear teeth to the hole, as well as with the speed with which heating is accomplished. On small gears, for which short heating cycles are required, shrinkage will be less than the shrinkage on larger gears which require longer heating cycles. It may be said that, on the average, the shrinkage of bores will be about 0.0005 inch per

In the spray quenching of metal parts, it is possible to use a light oil instead of water when the steel being used is of an oil hardening type. The use of oil spray quenching is usually limited to parts which are not subjected to excessive heat and whose areas to be heated are not too great. For larger parts, an immersion quench into an oil bath is to be preferred in order to avoid flashing of the oil. Normally, with comparatively small pieces, the inductively heated areas lose heat so quickly that flashing does not take place. With a larger part, however, the loss of heat is not as rapid, and flashing is a very definite possibility.

As a rule, some means of controlling

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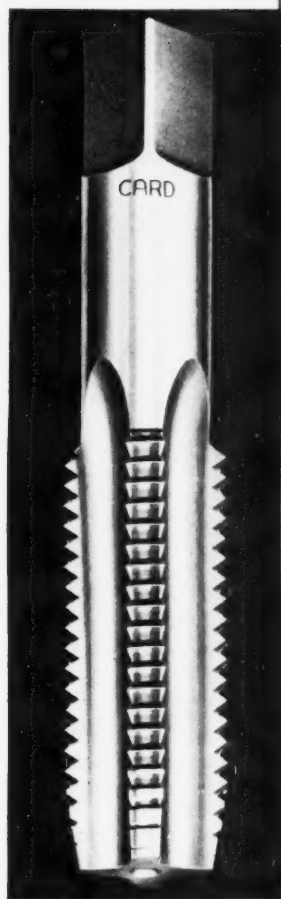
the temperature of the oil is required for an oil spray installation. A small heat exchanger unit will usually be suitable for this purpose. Temperature control should be provided so that operation of the exchanger will be automatic, thus maintaining the temperature of the oil within a desired range.

In some cases, it is possible to surface harden certain types of steels without using a liquid quench. This is accomplished by the rapid heating of a steel surface followed by a rapid natural cooling. By heating only a thin layer of a surface in a matter of about two or three seconds and then turning off the current, the surface heat may be dissipated into the cold mass underneath the surface at a rate which is fast enough to simulate an air quench. While this process is somewhat limited and requires a careful selection of the frequency and power supply in relation to the size of the part being treated, it nevertheless provides another feasible method of localized hardening.

Whenever this method is used, however, it is necessary to obtain a steel having air hardening properties or one having characteristics that offer the required hardness when cooled quickly. There are limitations to the degree of hardness which may be obtained; and, also, control is not as accurate as with the spray quenching methods. The power requirements for this type of heating may be high, especially in cases where high frequencies, on the order of 500 kilocycles or more, may be needed.

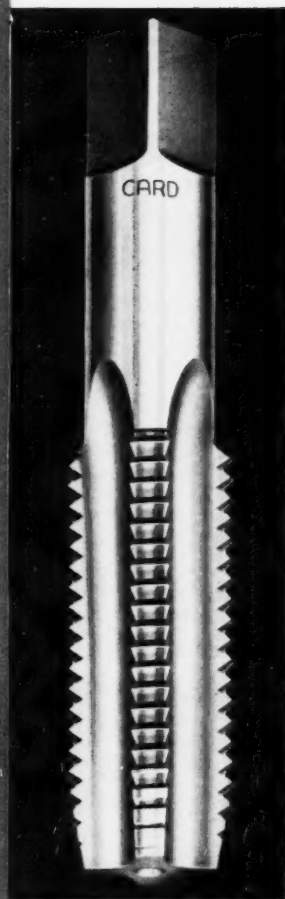
Progressive Hardening

While the method of induction hardening is used largely for the treating of small and medium-sized parts on which only the surfaces or restricted areas are heated, and quenched, the same process may be used quite well for the progressive hardening of comparatively long parts. The work to be treated usually is fed progressively



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through a coil which is arranged so that only a small section of the part is heated at one time. Then, as more of the workpiece is passed through the coil, the heated portion is subjected to a quench by means of a spray or an immersion bath, as may be desired.

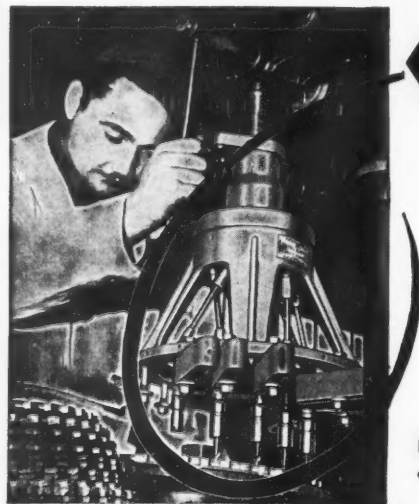
Among the major advantages of progressive induction hardening are (1) that high frequency generators of limited power may be used to process long parts which normally would require the use of more powerful heating units, and (2) that the distortion of a part which is so treated is usually much less than the distortion which would result if the part were heated all at once by other means. Also, a more uniform overall hardness may be obtained. Experience has shown that, with induction heating, it is much easier to progressively heat a number of small areas than it is to simultaneously heat one long surface because better electrical loading char-

acteristics take place. There is also a limit of coil length with respect to coil diameter after which uniform heating of the work becomes difficult; and therefore, the method of progressive heating is the only alternative for some cases.

Additional advantages of induction hardening include the following:

- (1) The speed of heating far exceeds the speed which may be obtained by other methods so that production possibilities become attractive.
- (2) Depth of case may be controlled as a function of feed rate and power input.
- (3) Quality may often be improved because heat may be accurately confined with uniformity.
- (4) Heat may be restricted to desired areas without affecting the ductility of adjacent areas, usually reducing the overall heating cost.

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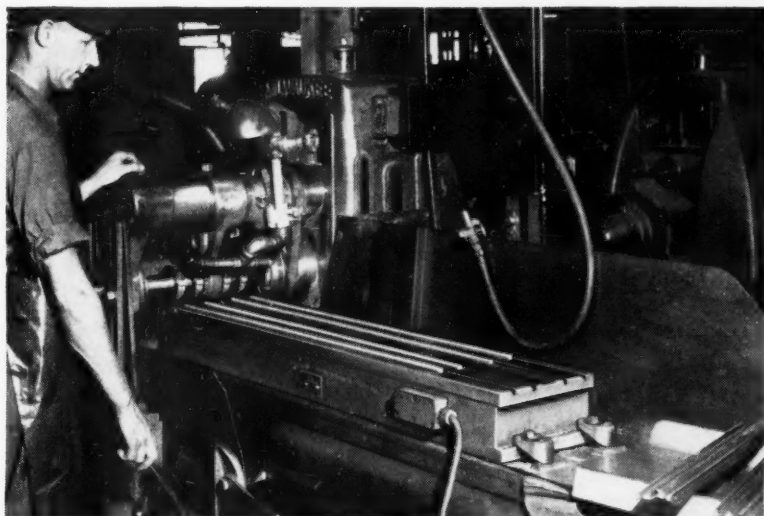
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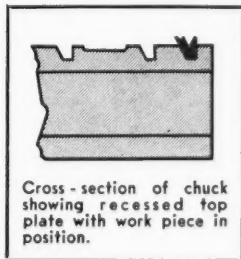
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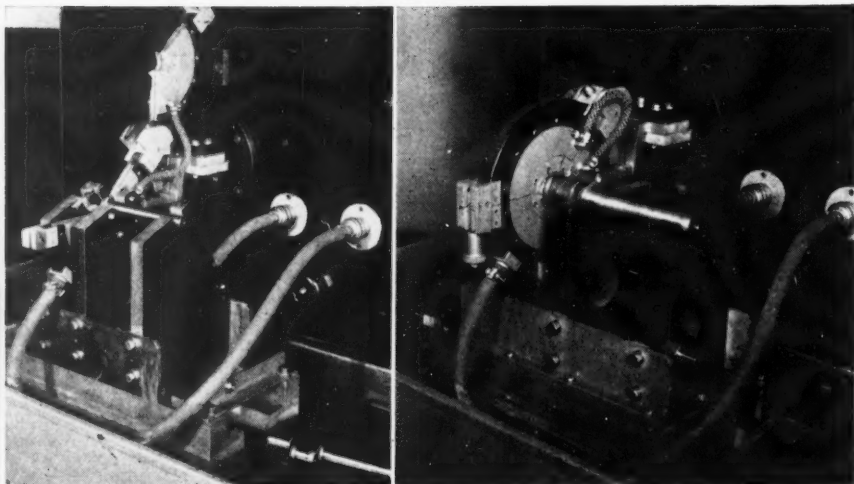
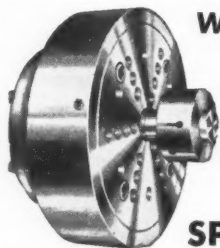


Fig. 7—Crankshaft bearing surfaces may be hardened by means of a split-type coil.
(Courtesy Induction Heating Corp.)

The application of progressive induction hardening is not too difficult if the work to be hardened lends itself to this method of treatment. The problems involved are usually those of determining suitable feeding mechanisms. For some operations, a conveyor or a sliding table may be used; whereas for other jobs, it may be necessary to provide special progressive feeding units or machines. The heating coils which are used for progressive hardening are generally simple in design.

The hydraulic-feed unit illustrated in Fig. 3 is one which is suited to the

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the upper center is motor driven (in order to rotate work at will), and it is provided with a quick-operating, self-clamping adjustment lock which is operated by pilot wheel E. The lower center bracket is made adjustable in order to accommodate different lengths of work. Variable feed control and a semi-automatic feed cycle are provided so that the operator need only to load a workpiece and engage a start lever in order to initiate a complete cycle. Skip-stop feed may be arranged in order to harden areas at intervals along the workpiece.

The amount of power which is required to progressively harden a steel shaft is a variable which depends upon the depth of case required, the type of coil used and its coupling, and the distance between the coil and the surface of the work. The chart in Fig. 4 shows graphically the power required to harden shafts of various sizes to a depth of about 1/32 inch, and the rate at which the parts may be moved progressively through the coil and quench.

The chart is used in order to determine an average production rate from a generator of a given size. Because of variations in steels and in quenching methods, it may be possible to obtain higher production rates than those given. To use the chart, first refer to the diameter of the work on the scale at the left; then determine the output rating of the power source on the lower scale. Project the readings horizontally and vertically, and the point at which the two lines coincide will indicate the rate of feed that can be applied normally under the specific conditions.

Progressive hardening may also be used for hardening the edges of flat bars; the bars are fed through coils which are made to heat the bar edges from sides. Parts such as lathe bed ways may also be hardened progressively by feeding them through suitable conveyor-type coils.

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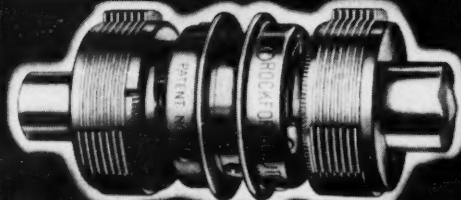
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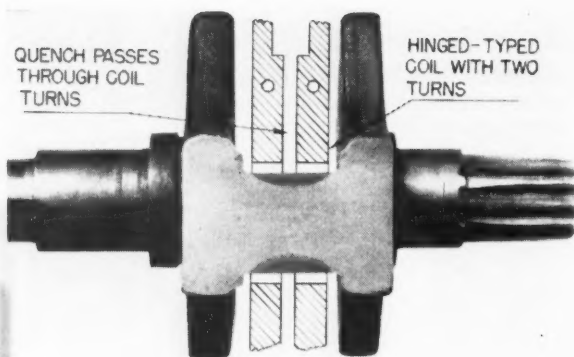


Fig. 8—An etched section of a hardened crankshaft bearing area and a two-turn coil which is used for heating.

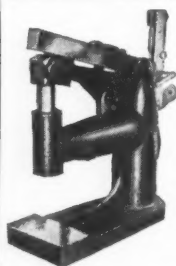
Another type of progressive hardening equipment, a rotary table unit, is shown in Fig. 5. The work is loaded onto the table top and then, automatically, it is passed through a coil and immersed into a quench. This type of equipment is particularly suitable for parts that normally will stand upright, as the example shown at the upper right in Fig. 5. A guide is fastened to the coil, as shown, in order to keep the work in a central position with respect to the coil and also to cause the work to revolve as it is fed through the coil. The feed rate may be varied by adjusting the off-center position of the coil in relation to the center of the table.

A progressive feed rotary type table unit which is used for hardening the heads of small screws may be seen in Fig. 6. The screws are placed on the

table at the front, and as they are moved into contact with the fixed guide, they are positioned correctly for entrance into the coil. The off-center position of the screws in relation to the rotation of the table causes them to be moved through the coil and, at the same time, to be rotated. After the screw heads have been heated by the coil, the screws are dropped into a quench tank, which is shown at the right.

In hardening a selected portion of a part such as a crankshaft bearing surface, it is usually necessary to use a split-type or hinged coil which is made in two sections. With one section of the coil in a raised position, the part usually is located in two V-blocks, and it is aligned radially by means of the bearing surface. After the work is positioned, the raised upper half of the coil is swung down, and it is clamped securely into place so that both halves of the inductor are in firm contact.

A setup for hardening the bearing surface of a single throw crankshaft

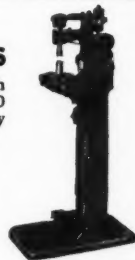


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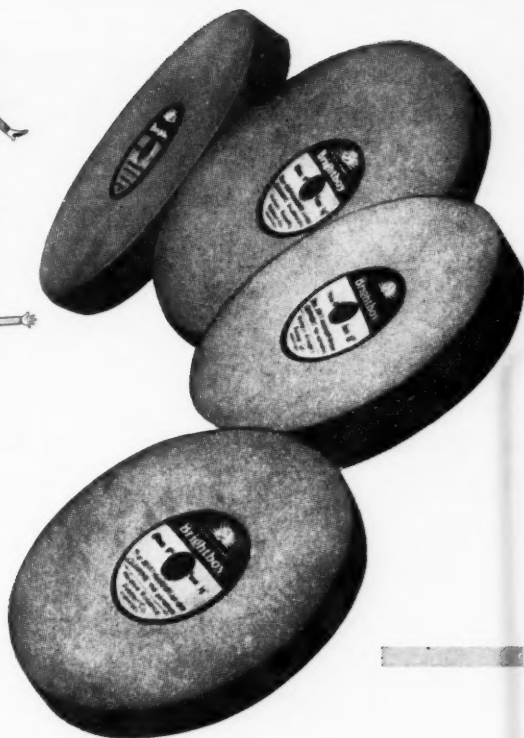
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may be seen in Fig. 7. The crankshaft is located in the fixed portion or lower half of the coil, as shown at the left; and then the upper section of the coil is lowered into place, as at the right. The coil is of the solid type, and it has two turns. The outer rim of the coil is provided with a built-up plastic housing through which the quenching water enters. The quench is passed through the spacing between the coil turns directly onto the heated portion of the bearing surface, and then it is flushed out at the sides of the coil. This arrangement is shown in Fig. 8, and

in this illustration is also shown an etched section of a hardened bearing surface. The bearing surface has a diameter of $\frac{3}{4}$ inch; the part has been heated for three seconds and quenched for four seconds; a 25 kw. output generator has been used.

The use of induction heating methods for the hardening of steel parts offers many advantages. Naturally, much depends upon the shapes of the parts and the types of hardening to be carried out. In general, however, the following summarized list of pertinent factors will apply broadly to this meth-

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od of heat treatment and will show some of the possible considerations for the hardening of parts in cases where induction heat may be applied.

- (1) A low operating cost is made possible as a result of localized heating, and the cost is especially low when compared to parts that must be heated through by other methods.
- (2) The use of induction hardening brings about a substantial reduction in heating time for a given surface, with the result that an increased output is usually made possible.
- (3) When induction hardening is used, subsequent operations may often be eliminated; and sometimes there is also a reduction in the number of preceding operations required. Cleaning and straightening often are unnecessary, as is tempering.

- (4) The substitution of high carbon steels, which may be induction hardened, for low carbon steels that require carburizing, and the substitution of plain carbon steels for alloy steels are methods of reducing costs.
- (5) With induction hardening, the surfaces are heated and quenched rapidly, and the inner surfaces remain relatively cool and metallurgically undisturbed.
- (6) Since induction heat is applied to the surface of a workpiece at an exceptionally fast rate, there usually is no time for oxidation to take place, and only a slight discoloration of the surface results.
- (7) In many cases, skilled operators are not required to operate induction hardening equipment, especially when automatic controls of heating and quenching are used in order to assure uniform results.
- (8) Induction heating equipment may be installed with other machinery in a production line because of the relatively clean conditions of operation.
- (9) Different degrees of hardness may be obtained on a single workpiece which has been induction hardened, a characteristic which sometimes is difficult or impossible to obtain by other methods.

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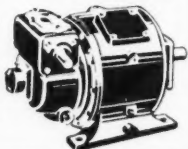

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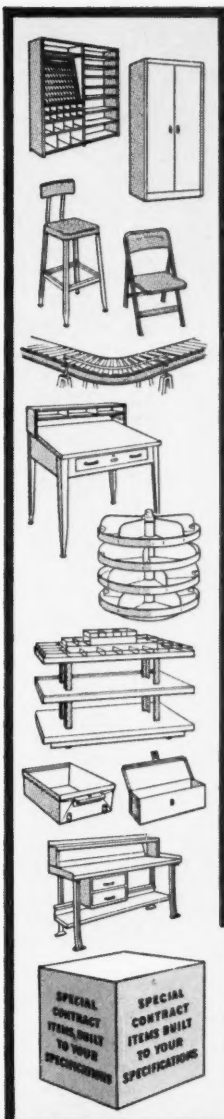
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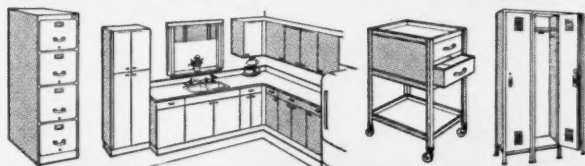


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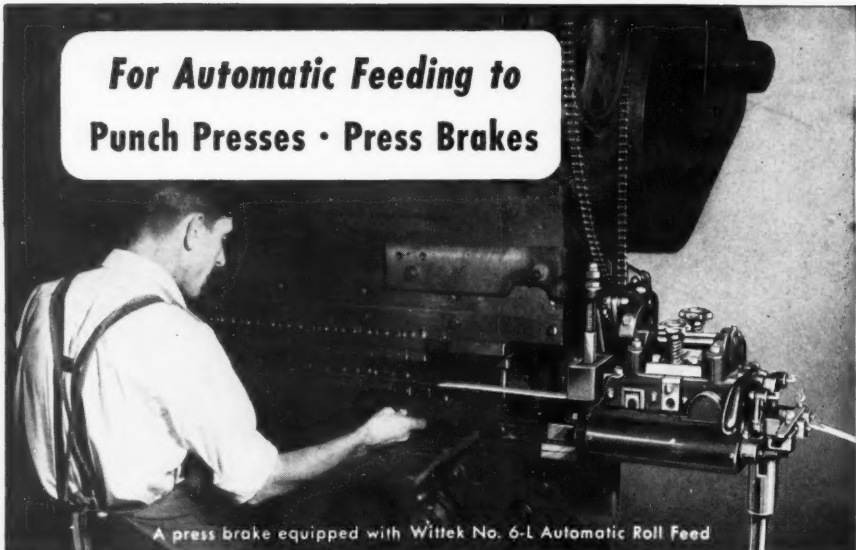
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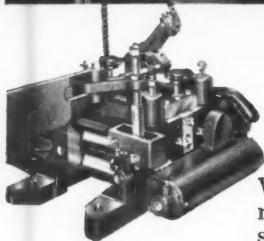
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An Analysis of Shaving and Burnishing Dies

C. W. Hinman

A discussion of several commonly used die designs for handling work economically in shaving dies

By C. W. HINMAN
Designing Engineer

LIGHT gauge sheets of fiber, Presdwood, ebonite, Micarta plate, Bakelite and similar nonmetallic materials may be easily pierced and blanked at room temperature in spring-pad dies. However, in order to successfully cut heavy gauge nonmetallic materials, the sheets should be heated above room temperature. Unlike sheet metals, unheated heavy gauge fiber blanks fracture easily and tend to crumble along the cut edges. To minimize this condition, cutting punches should be surrounded by a strong spring-stripper-pad, so that when the punches descend, the pad will contact the work sheet first and hold it firmly down on the die face during piercing and cutting.

For shaving the edges of a fiber blank, as shown in Fig. 1, more than the usual percentage of blank thickness must be allowed for cutting. For shaving sheet metal blanks, 6 to 8 per cent of the thickness is allowed, but for seasoned fiber blanks 10 to 12 per cent allowance is provided for the cuts. This allowance is added to the overall size of the blanking die opening. When shaving metal blanks, the beveled die edge **F**, Fig. 1, is omitted on the die

ring which is then ground flat with the surface of die block **H**.

The edges of blanks are shaved in order to obtain smooth edges which are square with the blank surfaces. Blanked edges are out-of-square because of the necessary clearance gap between the punch and die; and for heavy blank thicknesses greater punch clearances are necessary and the out-of-square conditions are considerably increased. But for blanks in ordinary use this discrepancy is permissible. Blanks usually have rough fractured edges arising from the break that follows punch penetration, and this fault is particularly exaggerated in heavy gauge blanks.

There are cases, however, where this condition is undesirable. For example: rough out-of-square edges, burrs, and rounded corners on the die side of blanks are objectionable on pawls, ratchet wheels, gears and many other working parts in assembled mechanisms. For satisfactory performance such parts must have smooth, square, and sharp cornered edges on their working surfaces.

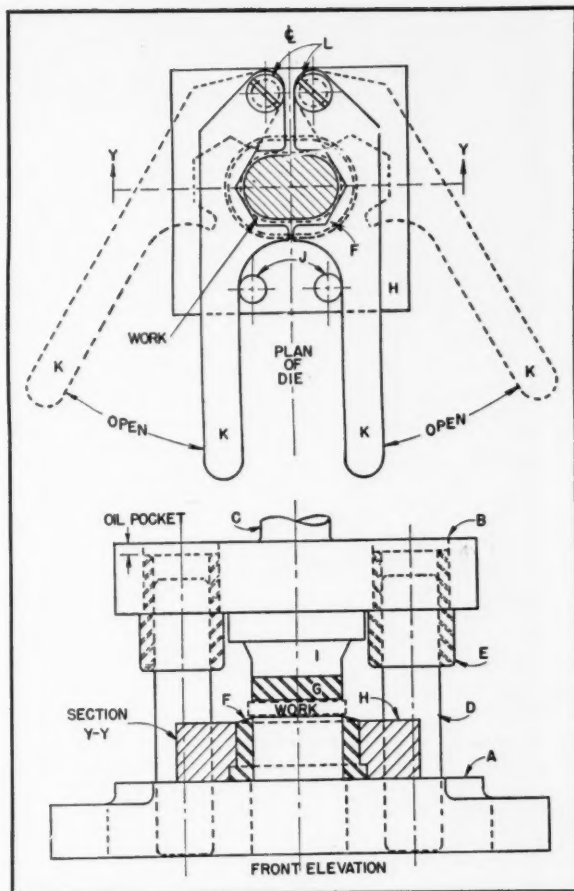
These desired conditions are obtain-

Fig. 1 — Centering a fiber blank in a nest over a die and then shaving its edges by punching it down through Stellite ring F.

ed by shaving the blanks through a second operation die. If the rounded corner must be removed, the blanks should be milled across the edges of their working surfaces. A dozen or more blanks may be milled in one setting. Milling must be deep enough to remove the rounded edge, and sufficient stock must be added to the blank size for that purpose.

Handling Work in Shaving Dies

This discussion will consider several of the commonly used die designs for handling work economically in shaving dies. Blanks that require shaved edges entirely around their contours are pushed through a die block by means of a punch having the desired size and shape, and which also coincides with the die outline. Punch clearance is practically a negligible amount, it should not be more than $1\frac{1}{2}$ per cent of the material thickness over-all, and die clearance is little or none. The die outline is carried straight through the die without the usual flare. However, at times the die contour is made to taper inward about $1/6$ of a deg., below one-half of the die depth, in order to burnish the shaved edges while pushing



the blanks out below the die block. This feature provides a design for a combination shaving and burnishing die. A comparatively heavy die set with two or four substantial guide posts should be used, depending upon the size and thickness of the workpiece.

Blanks are centralized over the die opening within a "nest of pins," or between a pair of centralizing hand-clamps K, Fig. 1. A shaved piece falls out under the die each time another blank is pushed in by the punch. Chips are blown from the die when the hand-

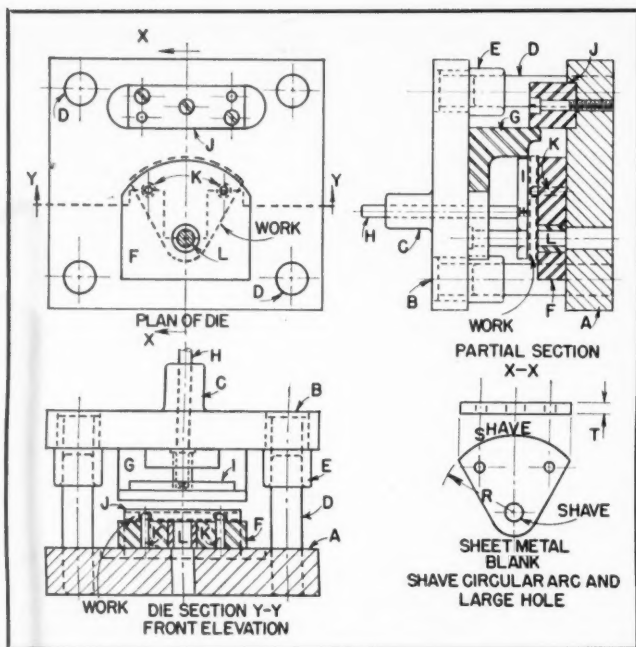


Fig. 2—Illustration of a simple die for shaving a circular arc edge and one hole in a medium sized sheet metal blank.

to the die making industry and the die engineering profession than to illustrate and describe press tools for special operations. Everyone knows that when one has mastered the principle in any designing problem, its practical applications follow readily.

Shaving Disconnected Edges

clamps are opened.

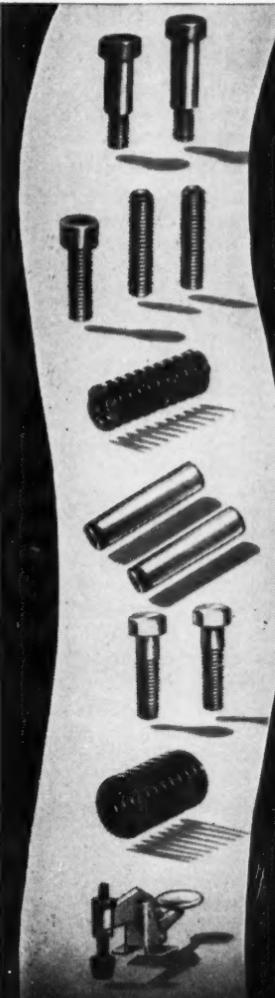
The lettering in Fig. 1 refers to **A, B, C, D, and E**, at the assembled die set. **F** and **G** are the hardened die ring and punch face respectively. **I** is a machinery steel punch attached to **G**, **J** shows two stop pins for clamps **K**, and **L** are two fulcrum screws for mounting the hand-clamps.

If the blank has previously pierced holes, pilot pins in the punch face engage the holes and guide the work straight and symmetrically into the die. In case there are no holes in the blank, a pair of centralizing hand-clamps must then be used as shown in Fig. 1. The hand-clamps are omitted in the front elevation to avoid a confusion of lines.

Since the scheme followed in this series of articles is to reveal the fundamental principles in die designs and how to apply them in everyday designing, such information is of more value

The die design in Fig. 2 shaves two disconnected edges, a circular arc and the larger hole in the sheet metal blank sketched at the lower right. The amount of metal shaved off is 8 per cent of **T**, which is the blank thickness. This amount is added to the finished size of the blank around the arc, and the interior hole is perforated correspondingly smaller in diameter to provide the necessary material. These allowances are taken care of by the designer of the blanking die.

Five general conditions govern the shaving of blanks. 1—Shaving the entire contour, as in Fig. 1. 2—Shaving only certain parts of the contour, as in Fig. 2. 3—Blanks that have no interior holes from which to register, as in Fig. 1. 4—Blanks with two or more holes in which to register the work over pilot pins, as in Fig. 2. 5—Shaving performed at one or more stations in two or three-step blanking dies, as in



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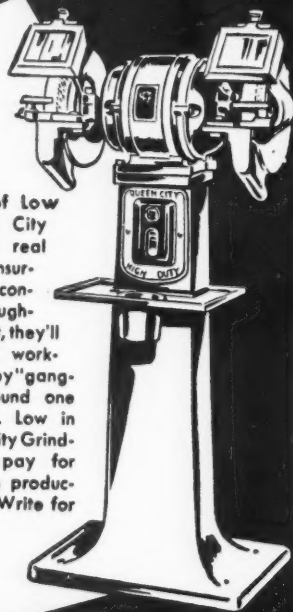
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Fig. 3. There are also progressive die designs for shaving blanks, and several designs of compound shaving dies which will be presented later.

Operation of the Die

Figure 2 illustrates a four post commercial die set in which special punches and dies are mounted to perform the work shown in the sketch. In this die, **H** is an ejector rod; **I** the ejector pad, and **J** a backing up heel for the main cutting punch.

The two smaller holes in the blank are placed over bullet nosed locating pins **K**, which project from the face of die block **F**. The main cutting punch **G** has a lower lip projection behind its cutting edge, which in descent, confines the punch between the die edge and back-up block **J**. This feature maintains the punch always in its correct position while cutting, and prevents its deflection while making the cut. This condition is seen in the upper right-hand view of the die.

When a blank is placed and the punches descend, the main punch shaves the arc against the edge of die block **F**, and a round punch shaves the interior of the larger hole through hardened bushing **L** in die block **F**, illustrated in the partial sectional view **X-X**. The chips fall below the die and do not interfere with placing the next blank.

The blank is now held tightly between the two cutting punches and is therefore carried up with the punches when they ascend. Near the maximum height of ascent, ejector rod **H** contacts the knockout bar across the head of the press and ejects the blank by means of ejector-pad **I**, which is positively attached to **H**. The shaved blank is blown from the die by compressed air and falls into a chute beside the press. However, by designing the cutting members turned around 90 deg., an inclined press can be used in which the work slides out into a container placed behind the machine.

VERSATILE

Heavy Duty Gage Blocks



- Assembled in a few seconds
 - Extra large gaging surface
 - Sturdy, rigid build-ups
 - Low in cost
- Details upon request

**CARBLOX
CARBIDE**



**STANDARD STEEL
BLOCKS**

Webber

GAGE COMPANY
12899 TRISKETT RD.,
CLEVELAND 11, OHIO

ANGLE BLOCKS



**H. D. BLOCKS
and FIXTURES**

LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

This type of shaving die has many uses. The work might be a gear segment in which its center hole and teeth must be shaved. The arc might be the edge of a peculiarly shaped cam, an eccentric or a specially shaped cam lobe. Shaving may be for only the interiors of several perforated holes, or

Shaving and Blanking Combined

One or more edges and several holes in a blank can be shaved to size by combining the shaving operations in a three or four station perforating and blanking die. This avoids handling the work twice and saves the expense of

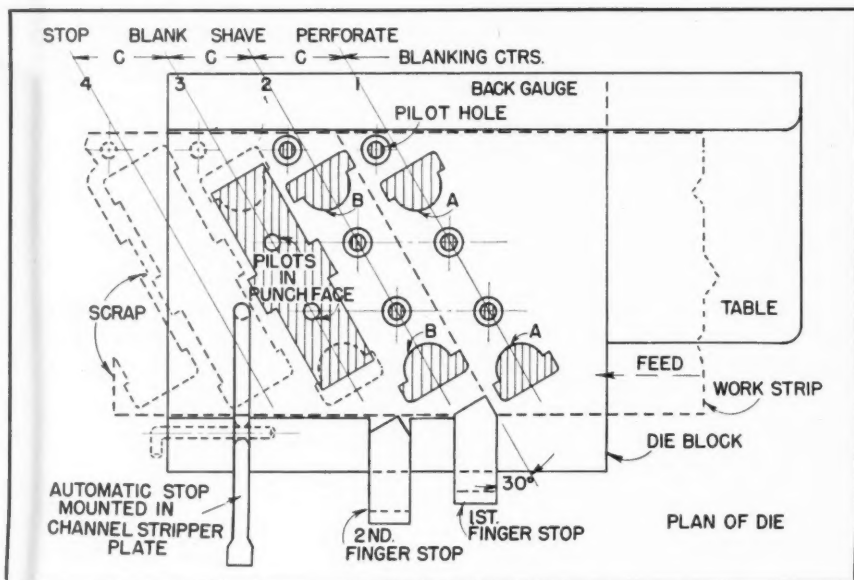


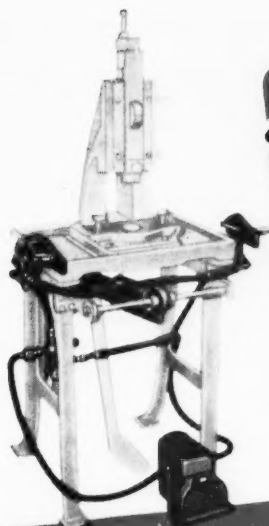
Fig. 3—Sketch of a four-station die for shaving both ends and two holes of a sheet metal blank in the same operation with perforating and blanking.

for different shapes of interior openings in the blank, and possibly without shaving any of its exterior edges or arms. The blank could be shaved on two or three of its side edges, with several interior holes included in the shaving operation.

In most shaving dies the punches and dies can be removed and other shapes of cutting members substituted for shaving various contours. Thus, one die set may be used for several different jobs.

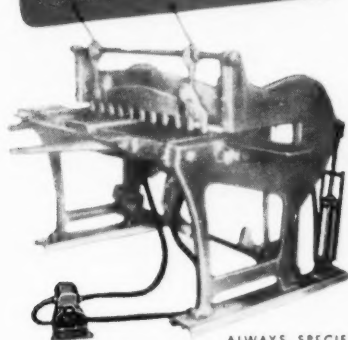
building and operating a separate shaving punch and die. The principle is presented schematically in Fig. 3.

All the round die holes are "bushed" with hardened and ground high-speed steel bushings. This precaution provides easy replacements for changing hole diameters, or for correcting the positions of holes if their locations have been changed slightly, or if holes are distorted when hardening the die block. The die openings in the sketch are section-lined for clarity.



The cost is low, installation easy

The cost of a Schradler Machine Control set is low, ridiculously low by comparison with the benefits and savings that can be effected. Any mechanic can readily and quickly make the installation.



1. **END PEDAL PUSHING**—Schradler Kick Press Control with Pneumatic Foot Pedal completely eliminates this tiresome, monotonous operation.
2. **ELIMINATE FATIGUE**—Operators welcome the relief of working with "kick presses without the kick".
3. **REDUCE SPOILAGE**—Air power exerts a uniform force every stroke, practically eliminates spoilage.
4. **INCREASE SAFETY**—The hand operated Kick Press Control enforces 2-hand operation, keeps hands out of the danger zone.
5. **INCREASE PRODUCTION**—The net result of easier, safer operation is an increase in production.

You can select the control that meets your individual needs.

HAND OPERATION—Keeps hands out of trouble. Operates at a touch of the fingers. It is a true 2-handed device.

FOOT OPERATION—Use where hands are required for positioning and holding the work.

HAND AND FOOT OPERATION—When the need for alternating from hand to foot control is required the hand set plus a foot pedal should be specified.

ADD SPEED CONTROL—Addition of a Schradler Speed Control Valve varies the speed of the stroke, accomplishes squeezing or broaching operations with ease.

ALWAYS SPECIFY SCHRADER, THE COMPLETE LINE OF AIR CONTROL PRODUCTS

2



MAIL THIS COUPON TODAY

A. SCHRADER'S SON, 475 Vanderbilt Avenue, Brooklyn 17, N. Y.
Division of Scovill Manufacturing Company, Incorporated
Please send me information and free literature about the products I have checked in the circles at the right.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

MMS

☐ Air Cylinders
☐ Operating Valves
☐ Press & Shear Controls
☐ Air Blowing Tools
☐ Blow Guns
☐ Air Line Connectors
☐ Air Hose & Fittings
☐ Hose Reels
☐ Hydraulic Gauges
☐ Pressure Regulators & Filters
☐ Air Strainers
☐ Lubricator-Tube Fittings

Operation of the Die

The two die openings at **A-A** trim the length of the blank of a length to provide metal for shaving in the next station. Trimming punches **A-A** and shaving punches **B-B** have back-up heels that enter the die openings ahead of the cuts. This feature is for guiding the punches and prevents their deflection as explained previously.

The blank is cut from 0.0625 inch steel strip. Eight per cent of the material thickness is added to provide metal for shaving, as explained above.

The ends of the work strips entering the die are cut off in a bias direction, as shown by the 30 deg. angular dimension. The purpose of the bias end is to prevent half cuts that produce punch deflections and nicked cutting edges, and to obtain a full blank at the entering end, by manipulating the finger stops. It is hardly possible to use square end strips in any die where the

blank is cut at a considerable angle across the strip.

When starting in a new strip, the operator halts it at correct positions by using the finger stops shown, and the strip is further aligned by the pilot punches that enter equally spaced holes, on blanking centers, seen along the top edge of the work strip.

At the third station two bullet nosed pilot punches in the blanking punch face enter the two shaved holes in the strip and position it correctly before the punch descends further to cut the blank. In the fourth station the automatic stop engages against the right-hand cut in the scrap strip and from there on, the job is ready to be run at high speed tempo. The sketch shows all the operations in regular order; perforate, shave, blank, and operation of the automatic stop.

The success of this type of die depends upon having at least two pilot holes in the blank from which to reg-




You're a Production Winner with **Economy** Drill-Jig Bushings and Gages

Yes, they're in stock, ready to go out to you — all A. S. A. standard types and sizes. You can also get fast service on new gages or gages salvaged by hard chromium plating . . . precision-finished, durable. Write for bulletin and price list.

Economy TOOL & MACHINE CO.

1827 SOUTH 68th STREET • MILWAUKEE 14, WISCONSIN

If you use **PUNCHES and DIES** *it will*
pay you to specify..
CLEVELANDS

A black and white photograph of a hand holding a cylindrical punch tool with a pointed tip. The hand is positioned in the center-left of the upper half of the advertisement, with the arm extending downwards and to the right.

We can furnish you with dependable Punches and Dies for all makes of Power, Hand or Foot Punching Machines and Presses, immediately from stock, in sizes ranging from 5/32" to 1 1/2" punching diameter. Special sizes and shapes to meet particular requirements are made to order promptly.

*If you use Punches and Dies we invite you
to write for a copy of our instruction sheet
on "The Proper Care of Punches and Dies."*

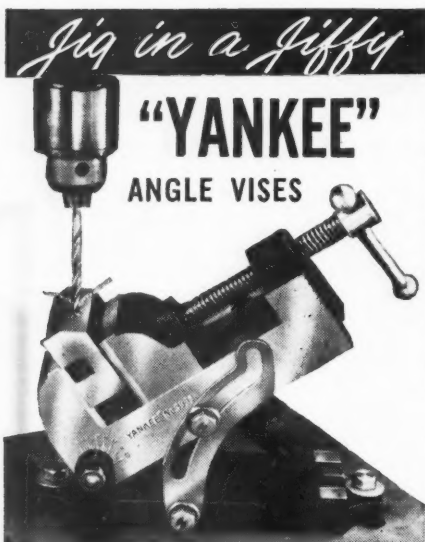
A horizontal banner for The Cleveland Punch & Shear Works Co. The central part features a shield-like logo with the text "THE CLEVELAND PUNCH & SHEAR WORKS CO. U.S.A." and "Established 1880". To the left of the logo, it says "PUNCHING TOOLS & DIES" and lists office locations: "NEW YORK... CHICAGO", "DETROIT... PHILADELPHIA", and "PITTSBURGH". To the right, it says "FABRICATING TOOLS" and "CLEVELAND 14, OHIO". At the bottom center, it says "POWER PRESSES" flanked by decorative dots.

THE CLEVELAND
PUNCH & SHEAR WORKS CO.
U.S.A.
Established 1880

PUNCHING TOOLS & DIES
OFFICES AT:
NEW YORK... CHICAGO
DETROIT... PHILADELPHIA
PITTSBURGH

FABRICATING TOOLS
CLEVELAND 14, OHIO

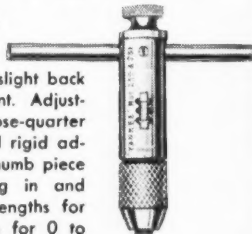
..... **POWER PRESSES**



Shortcut costs on small jobs with this fast-acting, economical jig. Lock the work in the "Yankee" Angle Vise. Tilt for the angle and lock. You're set up for every operation . . . hand or machine. Also available with quick-release swivel base. Two jaw widths . . . 2" and 2 $\frac{3}{4}$ ". Each vise supplied with grooved "V" Block for holding rounds.

"Yankee" Ratchet Tap Wrenches for tight spots

Ratchet needs only slight back and forth movement. Adjustable cross-bar for close-quarter work. R.H., L.H. and rigid adjustments. Knurled thumb piece for speedy starting in and backing out. Two lengths for 0 to $\frac{5}{16}$ " taps, one for 0 to $\frac{3}{16}$ " taps.



WRITE FOR "YANKEE" TOOL BOOK
NORTH BROS. MFG. CO.
Philadelphia 33, Pa.

YANKEE TOOLS
NOW PART OF



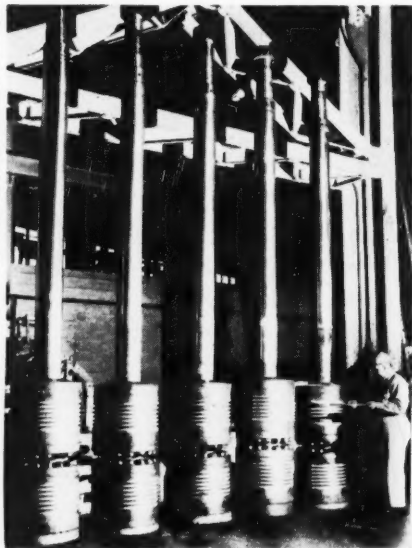
THE TOOL BOX
OF THE WORLD

ister the work by the entrance of substantial pilot punches which protrude from the face of the blanking punch. The diameters of pilot holes should not be less than 1 $\frac{1}{2}$ times the work material thickness for dependable registry of the strip for blanking. Larger holes than these are preferable if it is possible to have them. The same rules also apply to the diameters of the row of piloting holes in the edge of the scrap.

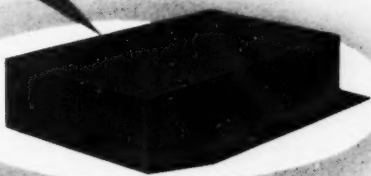
The following installments will discuss compound shaving dies, progressive shaving, automatic shaving equipment, and burnishing the interiors of tubes by using steel balls.

Stately Quintet

Five pistons from the Baumeister & Wain engines of the Diesel-powered Danish-built passenger liner "Aconcagua" lined up for inspection at the machine shop of Todd's Brooklyn Division where the vessel is being completely rehabilitated for the Turkish Government. The pistons, rings and sleeves, were re-machined, regrooved and tested.



Carboloy announces . . . an improved grade 905

- 
- More wear resistance
 - Greater cutting edge strength
 - Greater chipping resistance
 - Greater cratering resistance
 - No break-out of crater lip on longer runs
 - Easy to grind
 - Easy to braze
 - No "special" feeds or speeds required
 - Better heat conductivity—more rapidly dissipates heat at cutting edge
 - Holds size with uniform land wear

For machining today's high tensile-strength cast iron

TOOL LIFE can be doubled when machining high tensile-strength cast iron with Carboloy's improved Grade 905! Equally improved tool life is possible on non-ferrous metals.

This improved carbide is a direct result of Carboloy's continuing policy of improving all grades to meet machining problems brought about by metallurgical developments. It brings production-increasing, money-saving performance to your machining jobs.

Here's proof

Carboloy's improved Grade 905 was used on a job involving the complete machining of 180-230 Brinell cast-iron clutch pressure plate faces. Procedure was (1) rough facing— $\frac{1}{8}$ " depth, .030" feed and SFPM of 215 to 355; and (2) finish facing— $\frac{1}{32}$ " depth, .020" feed and 320 to 550 SFPM. On this job, competitive grades turned out 97 pieces per grind, while Carboloy's improved Grade 905 turned out 149 pieces!

Why not take advantage of the time, labor and money savings improved Grade 905 brings you? Specify it in your next order. Carboloy Company, Inc., 11143 E. 8 Mile Avenue, Detroit 32, Michigan.

Here's a case history of the amazing performance of Carboloy's improved Grade 905.

CASE X

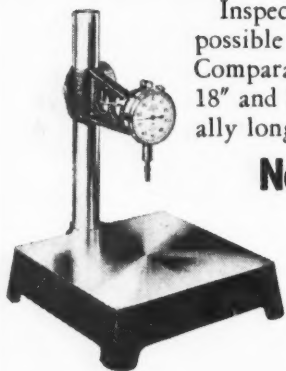
Job: Precision-boring back bearing holes for crankshaft in cylinder blocks.
Material: Alloy cast iron.
Bearings: 2 $\frac{1}{4}$ " diam. bore, 2 $\frac{1}{4}$ " long.
Depth of cut—.009" to .010"
Feed—.010"
Competitive grade (Avg.) — 1000 pieces per grind. SFPM—438
Improved Grade 905 (Avg.) — 2000 pieces per grind.

CARBOLOY®

CEMENTED CARBIDE

AMES

NOW — GREATLY INCREASED MEASURING CAPACITY FOR AMES No. 13 & No. 130 DIAL COMPARATORS



Inspection of a much wider variety of parts is possible with Ames No. 13 and No. 130 Dial Comparators, now that longer columns — 12", 18" and 24" — have provided them with unusually long ranges.

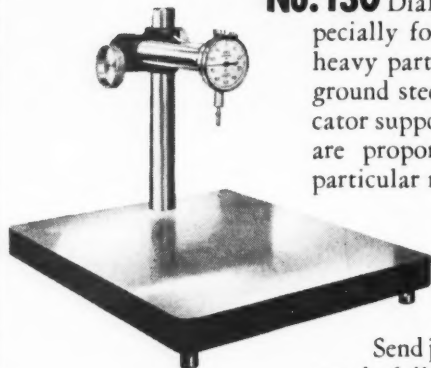
No. 13 Dial Comparator features ground-flat cast-iron base of ample size for using V-blocks and locating fixtures. Accurately adjustable bracket holds any Ames Precision Dial Indicator. Measuring capacities available — 6", 9", 15", 21".

*Representatives in
principal cities.*

B. C. AMES CO.

*29 Ames Street
Waltham 54, Mass.*

Mfr. of Micrometer Dial Gauges • Micrometer Dial Indicators



No. 130 Dial Comparator is designed especially for inspecting comparatively heavy parts. For this reason the flat-ground steel base, the adjustable indicator support, and the upright column are proportional to suit the user's particular requirements.

Send job specifications and we will supply full details without obligation.

**HERE'S
A LESSON
IN VALUES**



these valves pay their way every day and require no maintenance after installation.



BY-PASS OIL-RELIEF VALVES

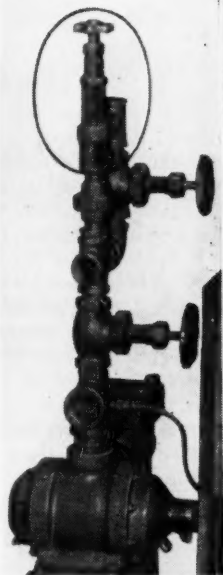
Functional operation is at its peak . . . convenience and efficiency in maintaining constant pressure are evident in the trouble-free, automatic valves as they continue on the job without interruption. Write for details.

Illustration shows Fulflo relief valves built in oil spray systems by The Brown-Fayro Co., Johnstown, Pa.

Write on your letter-
head for FULFLO
MECHANICAL DATA
BOOK.

FULFLO COOLANT PUMPS

to keep tools, machines and work cool . . . to cut down wear and tear by friction due to abrasives or cutting. All types for all purposes.



Specialties Co., Inc.
BLANCHESTER, OHIO



Karl F. Kirchhofer

Sales Hints for the Smaller Shop

A consideration of available methods for advertising products and services

By KARL F. KIRCHHOFER

IN this month's column we will try to point out how space advertising in both daily newspapers and trade journals can help to build up business for the smaller metal-working organization. When you start to think in terms of space advertising, no matter whether it is merely a printed card; advertising your name in the newspaper, or a product campaign in the trade journals, make up your mind from the start, that you are going to do it consistently. Decide at the beginning to give the medium you select a fair chance to show results.

Advertising has a cumulative effect. People seeing it once may forget, but people who are reminded constantly every day, week or month don't have a chance to forget. And, when the need arises for your services or your product, they are going to think of you and buy from you—certainly not from the nonadvertiser they don't even know exists. This point is basic—decide to advertise consistently.

On the other hand, let's swing the pendulum the other way. A certain plant advertised its product, an instrument of some sort, in a magazine serving the metal-working industry. It was

a half page advertisement and the response was astonishing. Soon, this extremely small shop man had two months' work ahead of him. When the advertising representative called on him to obtain a year's contract, the shop owner blandly showed him all the orders he'd received, told him that his machines were tied up for a couple of months ahead, that he really couldn't handle any more work and therefore had decided not to continue to advertise. This incident is not a figment of the writer's imagination. It was related by an advertising salesman whose veracity I have no reason to doubt. No matter how much business you have, no matter how big your back-log is today, keep your name before your customers always. If you're running three months behind, quote your inquirer four months. Or better still, buy additional equipment, put on a lathe or grinder hand to speed-up your deliveries. This does not necessarily imply that you should over-expand, but caution in the matter of adding new equipment can also be overdone. At any rate, one alert young partner in a successful shop of my acquaintance says, "Slow? Why no,

W. O. BARNES CO., INC. HAND AND POWER HACK SAWS—BAND SAWS

**A CHIP
off the Old Block**



We Know
You'll Think So
When You Try The

RED ROCKET



IT'S BARNES' NEW POWER HACK SAW BLADE

The Red Rocket combines increased toughness and flexibility for high production metal cutting at low operational cost.

The Red Rocket will provide you with the uniform hardness and cutting ability so characteristic of all Barnes Blades.



Established
1919

W. O. BARNES CO., INC.

1297 TERMINAL AVE.

DETROIT 14, MICH.



THE ELLIS DIVIDING HEAD

Many unique features make the ELLIS Dividing Head more than an ordinary indexing fixture. It is a precise, rugged unit with $6\frac{1}{2}$ " normal swing increased to 11" swing through the use of riser blocks. It TILTS more than 100 degrees in the vertical plane—SWIVELS 360 degrees in the horizontal plane—INDEXES by crank, or directly by hand. Work is held between centers, or in chucks or collets. The ELLIS Dividing Head is a universal work head that will increase the production versatility of your milling machines, grinders, drill presses and jig borers—write for complete details today.



we've got lots of work. I guess we've a three or four months' backlog."

I said that many shops were complaining about poor business. I asked him what he did to maintain his backlog. He smiled, "Well, I keep one salesman out every day making calls. He visits all the big firms in upstate New York, throughout New England, wherever we think there might be tool, die and fixture work. Right now he's in Endicott, New York. Even though we have a backlog I don't care if we're a year behind on making deliveries, we never stop selling and we never stop advertising. I can truthfully say that we've never had any really bad times."

Too many shops hide their "light under a bushel." Many are so modest that they paint their name in scarcely discernible type on their front door and the passing multitude has no idea what is going on inside. Here's an illustration that should make every small shop owner more advertising minded.

One day, a design engineer in one of our better known aircraft plants drove to his work, taking a short cut that he'd never used before. As a matter of fact, his usual mode of transportation was the Long Island Railroad. The short cut carried him past the door of a modest little building, located in a gully near the railroad tracks, that bore the legend, "White Tool and Mfg. Co." He stopped the car and entered.

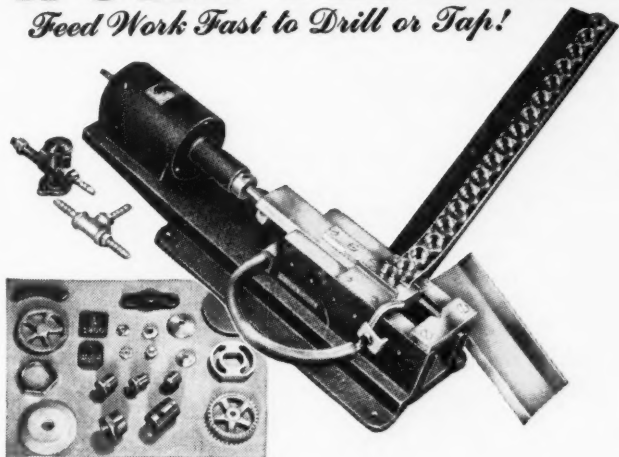
"Would you be in a position to do some sub-contract work for us. It's intricate and delicate, close tolerances, requires a lot of grinding. I see you've got the equipment. What's your experience, your background?"

Proudly the shop man reeled off the impressive list of fine concerns he'd worked for, ending with the name of a nationally known watch company. "I was plant superintendent there too," he continued, "then I went into business for myself."

"Okay, you're on," said the engineer.

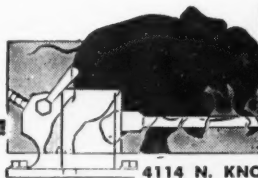
Boost Output with **MEAD** **WORK FEEDERS**

Feed Work Fast to Drill or Tap!



As-fast-as-you-can-step-on-a-button the sensational new Mead pneumatic WORK FEEDER delivers, holds, ejects small parts to be drilled, reamed or tapped. Accommodates stampings, castings, screw machine parts, etc. Adjustable to sizes up to 3". Foot or automatic control; operator's left hand is free to keep hopper loaded.

Write for new Mead AIR POWER Catalog describing "Mead Family" of air operated fixtures and devices



MEAD

SPECIALTIES COMPANY

4114 N. KNOX AVE., DEPT. AA-119, CHICAGO 41, ILL.

Buy KIPP AIR GRINDERS Because

The RPM's stay up while grinding ... not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind — not just rub. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

MODEL JA
50,000 R. P. M.

\$42⁰⁰

IN U. S. A.



Weight 12 ounces;
length 6¾ inches;
chuck size ⅝ inch.
Wheel guard re-
moved for better
illustration.

MADISON-KIPP CORP.
208 Waubesa St., Madison, Wis., U. S. A.

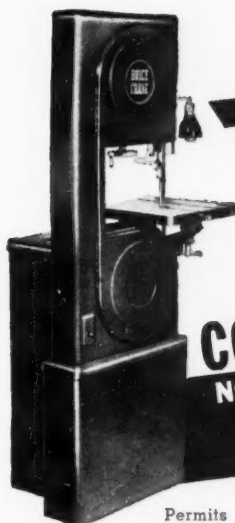
• Skilled in DIE CASTING Mechanics
• Experienced in LUBRICATION Engineering
• Originators of Really High Speed AIR TOOLS

"Drive down to our plant this afternoon and I'll give you the prints."

He turned to go. "Do you realize that I noticed your shop by the merest coincidence. If I hadn't been driving through here this morning, I wouldn't even know that you existed. Now look, you're located practically on the tracks of the Long Island Railroad. For years I've been riding the 8:08 and I never knew you were here. If I had known of your experience and your shop here why we might already have done thousands of dollars' worth of business. Here's a suggestion you may take for what it's worth. Why don't you erect a large sign on the roof of your building so that the passerby will know you're in business. Put up a display saying something like 'White Tool and Mfg. Co., The Finest Precision Work. Try us for price and quality.'"

"Undoubtedly among the thousands of commuters who pass your building daily there are others like myself who are seeking expert toolmakers to perform intricate jobs. Put that sign up and I'll wager you'll fill this plant with work." Are you near the railroad tracks? Lots of shops are. Are you located on or near an important road or highway that carries lots of traffic? Plenty of shops are. Regardless of where you may be located, don't hide your light under a basket. Take a tip from the design engineer and erect a big sign on your building advertising your services to the passing world.

Plate and Sheet Cutting Machines. A six-page folder describing a line of sheet steel and plate working machines has been announced by the American Pullmax Co., Inc., 2627 N. Western Ave., Chicago 47, Ill. Seven different sizes of machines are described ranging from the small AM Model for cutting mild steel up to 14 gauge to the "Major" which works mild steel up to ⅜ inch. Also described are attachments for straight, circle, and slot cutting, as well as for beading and folding.



Announcing
 THE SENSATIONAL, NEW
BOICE-CRANE
 ALL-PURPOSE, COMBINATION
CONTOUR SAW-BAND FILER
 NOW EVERY SHOP CAN AFFORD EQUIPMENT
 FOR MODERN SHORT CUT CONTOUR
 MACHINING BY BAND SAW!

Permits amazing savings in time and money. Ups production as much as 1000%.

Maintenance and short run production parts; tools; metal templates; special wrenches and wrench templates; cams; spiral parts; irregular shape stacked parts; stamping, forming and trimming dies all produced in minutes instead of the hours required by old methods involving milling, shaping and hand filing.

Precision filing and file broaching to a layout finish line and flash removal in *one-ninth* the time required by hand and *one-fourth* the time required by reciprocating filing machine. Eliminates guesswork in angle filing.

The only combination Contour Saw and Band Filer with any one of 8 speeds instantly available up to 4100 blade f.p.m. for efficiently cutting wood, sponge rubber, masonite, etc.—and ranging down from there to a slow 92 blade f.p.m. A speed for cutting every metal and material like bar and sheet steel; steel, brass and aluminum tubing; hard rubber, transite,

cast iron, plastics, bronze, synthetic glass; sheet asbestos; bakelite, and tool steel up to 1" thick, and for filing a variety of metals and other industrial materials. Wheel speed chart, for cutting all these and more, mounted right on machine.

Permits all the modern, high speed production techniques of inside, as well as outside, contour sawing.

Heavy, rigid, 10-gauge solid welded steel frame.

Specially designed guides sharply reduce blade costs. Handle blades 3/16" to 3/4" wide. 15" x 15" heavy ribbed cast work table, ground to close machine tool limits and mounted on two heavy cast trunnions.

Enclosed Textolite disc wheels balanced for speeds in excess of 4100 blade f.p.m.

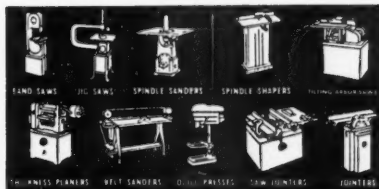
File bands are available for all purposes, in two widths, two shapes and six cuts. The file segments have exclusive, patented self-aligning ends which automatically lock to produce a continuous, rigid, flat surface.

Band Files in 1/4", 3/8" and 1/2" widths, Flat and Oval, in a total of ten tooth styles to fit other make machines.

COMPACT • PORTABLE • ACCURATE • RUGGED • LOW COST

IDEAL FOR: TOOL AND DIE SHOPS
 TESTING LABORATORIES
 MILLWRIGHTING AND REPAIR SHOPS

PRINTING PLATE MFG. PLANTS
 MACHINE SHOPS
 SCHOOLS
 INSTITUTIONS

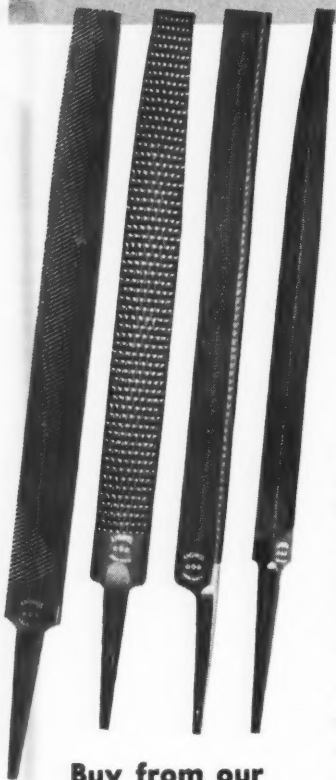


USE COUPON TO GET FREE LITERATURE

BOICE-CRANE COMPANY
 937 Central Avenue, Toledo 6, Ohio
 Please send free literature on the new Boice-Crane
 Combination Contour Saw-Band Filer.

Name.....
 Firm.....
 Street.....
 City & State.....

50 Years of Experience in Precision File-Making Behind



Amswiss
**AMERICAN
PATTERN FILES**

For half a century, our skilled craftsmen and our special equipment have been devoted to the manufacture of "American-Swiss" Swiss Pattern Files.

With this background of experience in making these precision tools, we now offer our new line of "AMSWISS" American - Pattern Files . . . made to similar high standards of workmanship.

When you buy "AMSWISS," you can be sure of uniformly hard, accurately cut, long-wearing American-Pattern Files. The "AMSWISS" line includes a complete range of types, sizes and cuts of these files, all guaranteed to be perfect in every respect.

Write for our "AMSWISS" Catalog, with complete descriptions and listings.

**Buy from our
Authorized
Distributor**



AS-164

AMERICAN SWISS FILE & TOOL CO.
410 TRUMBULL STREET, ELIZABETH 1, N. J.

Also manufacturers of Swiss-Pattern files, milled curved-tooth files, rotary files and mechanics' hand tools.

HEAT TREAT

SMALL PARTS, TOOLS & DIES

In Your Own Plant

- Install anywhere by simple wire connection. Quiet in operation. No fumes or odors.—no ventilating required.
- Any intelligent man can operate furnace with automatic temperature control, using established procedures.
- Operating cost under 4c per hour to hold 1600° F. in Model 3 furnaces, with 2c per kw.-hr. rate. Others in proportion.

NOW YOU CAN heat treat, harden and temper small parts in your own plant... without experienced heat treaters. Economical to install and use. Cooley Electric Furnaces operate efficiently at high or low heats, and save your large furnace time for work requiring large volume capacity. Here are some profitable uses:

PRODUCTION HEAT TREATING of small parts... Small batches... Running pilot lots to pre-determine mass production techniques... Emergency repairs... Industrial and laboratory testing... Miscellaneous controlled heating jobs.

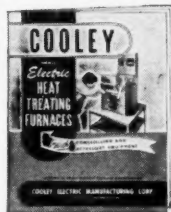


| CHAMBER | 8"W 6"H 14"L | | | | 10"W 6"H 18"L | | | | 8"W 6"H 14"L | | 10"W 6"H 14"L | |
|------------|----------------|--------|--------|--------|----------------|--------|--------|--------|----------------|--------|-------------------------------|--------|
| MAX. TEMP. | 1850° F. | | | | 1850° F. | | | | 2000° F. | | 900° F. 1200° F. | |
| AMPERES | 14.8 at 230 v. | | | | 19.6 at 230 v. | | | | 20.2 at 230 v. | | 17.5 at 230 v. 17.5 at 230 v. | |
| WATTS | 3400 | | | | 4500 | | | | 4650 | | 900 Max. 1200 Max. | |
| MODEL* | MH-3 | VH-3 | MK-3 | VK-3 | MH-4 | VH-4 | MK-4 | VK-4 | VK-5 | VK-6 | ACL | ACH |
| PRICE | 200 00 | 230 00 | 250 00 | 280 00 | 295 00 | 325 00 | 345 00 | 375 00 | 420 00 | 340 00 | 385 00 | 410 00 |

* M models complete with hinged door and hearth plate. V models have counterweighted vertical lift door. K and AC (air circulating with built-in fan) models include Selective Power Modifier for input control to correct temperature lag.

NEW INDUSTRIAL BOX FURNACES—New Cooley door design insulates front section and reduces thermal losses to give greatly improved operating performance. Available in 3 sizes, 12"W x 8"H x 18"L, 24"L, 36"L. Maximum temperature, 1850° F. Also pot furnaces for hardening and tempering to 1650° F. Write for New Furnace Data plus Simplified Heat Treating Instructions.

ACCESSORY EQUIPMENT—All standard makes of controllers are available. Prices complete with Thermocouple and lead wire range upwards from.....\$163.00.
Enclosed panel containing controlling pyrometer, line switch and fuses with steel stand completely wired, range upward from.....\$293.00.
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"LEADERS IN SMALL ELECTRIC FURNACE MANUFACTURE"



MH-3-4



VH-3-4



MK-3-4



VK-5



VK-6

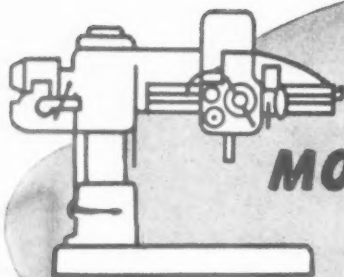


AC-L-H



BL 1,2,3

Indianapolis Machinery Export Corporation, Export Manager, 44 Whitehall Street, New York, New York



MODERN EQUIPMENT AT WORK

Crush Grinding 4,000 Parts per Hour

A TRUFORMATIC crush grinding machine has been developed by The Thompson Grinder Co. of Springfield, Ohio, in which simple or intricate contours may be produced, with a high degree of efficiency, in large quantities of small parts. For an example, in the machine illustrated in

Fig. 1, convex and concave finished edges are produced on lock stampings at the rate of 65 parts per minute.

The stampings are loaded in fixtures such as the ones shown in Fig. 2; these fixtures are made to accommodate as many as 160 stampings at one time. The fixtures, in turn, are loaded vertically on the indexing table of the machine. Two fixture locations, 180 deg. apart, are provided in the indexing table; thus, while one fixture is in the work position and the stampings are being ground, another fixture may be unloaded and refilled on the other side of the table.

After the original settings on the machine have been made, the entire working cycle is controlled automatically by means of push buttons. The wheel head is moved in horizontally to contact the work on the table, and the indexing table is raised. The work is ground in a single pass as the form is transferred from the master contour

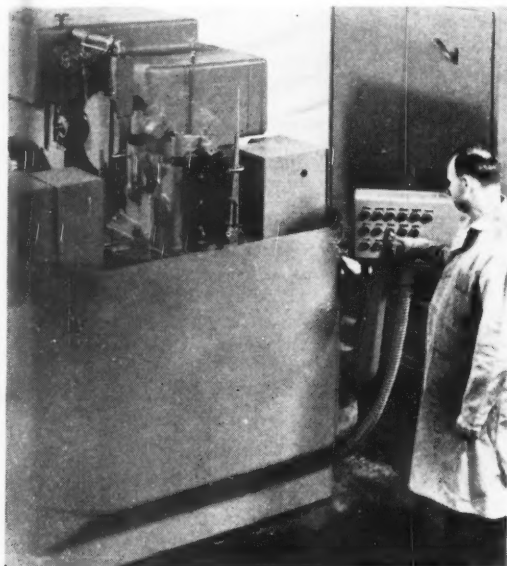


Fig. 1—Thompson Truformtic grinder in which production of 4,000 parts per hour may be obtained.

SPRINGFIELD

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Fig. 2—Illustration shows a typical fixture being loaded. Master contour rolls may be seen behind other loaded fixtures.

wheel and ground into the metal parts. The worktable stroke may be varied from 3 to 16 inches at any feed rate up to 15 feet per minute.

After a desired form has been produced on a series of parts, the wheel head is retracted, and the table is returned to loading height and indexed for another work cycle. Approximately 25 work cycles may be completed in the machine every hour; and if a maximum number of parts is loaded in each fixture (160), a production rate of approximately 4,000 parts per hour may be obtained.



Special Machine for Tapping Cylinder Blocks

A SPECIAL multiple spindle Trans-fer-matic machine for tapping cylinder blocks has been built by The Cross Company, Detroit, for a large



Features the exclusive TEMCO "Double Door" that saves processing time and cost... For access, just lower bottom half... upper portion remains fully closed to hold in heat. Easy-operating controls let you open and close bottom half, or both sections, at will.

TEMCO

It's new

SERIES 1700 ELECTRIC FURNACE

FOR HEAT-TREATING TOOLS, DIES, PARTS

A husky unit for continuous production. Has the room needed for larger parts lending themselves to bench-type heat-treating. A sturdy all-around furnace with welded steel body and 6" dual insulation. Designed for 230-volt operation at 1650°F. continuous, 1900°F. intermittent. Two chamber sizes: 8½"W, 7½"H, 13½"D and 8½"W, 7½"H, 18"D. Available without controls, or with Temcometer stepless input controller and indicating pyrometer, or with Veritron electronic controlling pyrometer.

| MODEL | CHAMBER W" H" D" | FURNACE ONLY | WITH TEMCOMETER | WITH VERITRON |
|-------|---------------------|-----------------|--------------------|------------------|
| 1730 | 8½x7½x13½ | \$195.00 | \$250.00 | \$365.00 |
| 1740 | 8½x7½x18 | 235.00 | 290.00 | 405.00 |

Write for data and dealer's name

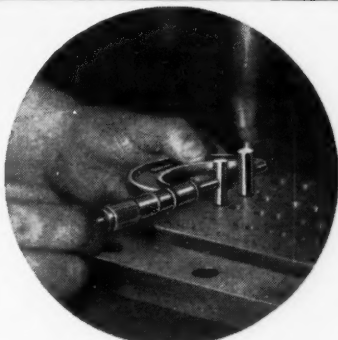
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Eliminate fumbling and guessing when gaging Holes, Slots, Finding Centers, Locations, Etc.

Horberg Drill Size Pin Gages are accurate to $\pm .0001$ —.0000.



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DEPENDABLE GAGING

1½" long. For easy insertion, precision alignment, lower half is concentric tapered to fit holes 0.0012 smaller than gage size. Oil hardened tool steel. No other pin gage has such accuracy at so low a cost.

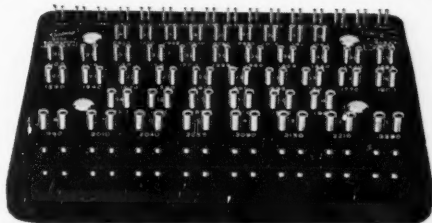
INDIVIDUAL STOCK SIZES \$1.00 each

LETTER SETS: 52 gages from A to Z—\$45

FRACTION SETS: 60 gages ¼" to ½" in steps of ⅛" — \$50.

NUMBER SETS: 120 gages 1 to 60 — \$90

STAND ALONE — \$10

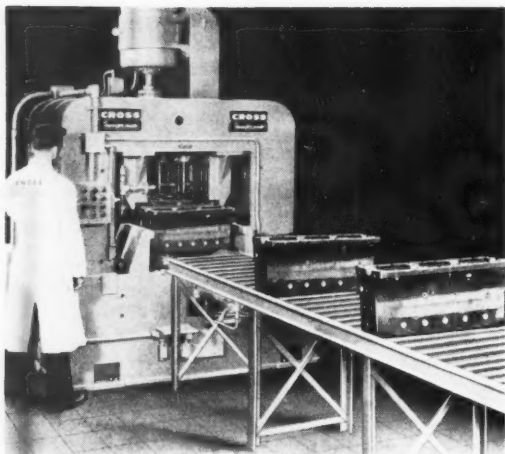


Sets come in pairs for gaging any number of similar holes. All sets include stands of 3 plates and cover, so that gages stand upright. Drill size is plainly stamped in front of each hole, together with decimal equivalent to the ten-thousandth of an inch.

Prices F.O.B. Bridgeport, Conn. Immediate Delivery.

THE *Horberg* GAGE COMPANY

19 STAPLES STREET, BRIDGEPORT 1 CONN.



Cross multiple spindle tapping machine.

automatically and transferred from station to station.

Special features of the machine include lead screw feed and the use of standard Cross sub-assemblies to provide flexibility for reasonable part design changes. The interchangeability of these self-contained units also assures low maintenance costs and minimum down time.

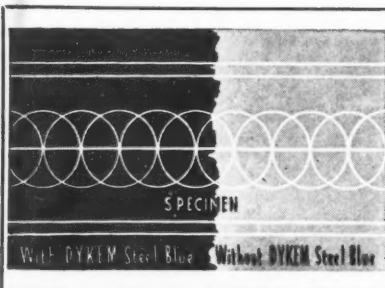
automotive manufacturer. The machine, which is shown in the illustration herewith, is being used to tap the pan rail and ends of cylinder blocks at a production rate of 130 parts per hour at maximum efficiency. Since the installation of the machine, the cost per piece has been noticeably reduced.

Four stations are provided in the machine. The first and fourth stations are used for loading and unloading, respectively. At the second and third stations, 30 holes are tapped in the pan rail, 14 holes in the front face and six holes in the rear face. The operator simply positions a cylinder block at the loading station and presses a cycle button; the parts are then machined

New Installation Boosts Brazing Rate

A LARGE bicycle manufacturer reports the fact that since the installation of new automatic high-temperature, radiant gas-burning brazing equipment, the rate of brazing bicycle fork assemblies has been increased to 300 per hour. The brazing unit, which was designed and built by Selas Corporation of America, Philadelphia, is shown in the accompanying illustration.

The unit was designed to have a special rotating hearth. The fork assemblies are mounted on this hearth; and as the hearth is indexed in a clockwise



DYKEM STEEL BLUE

Stops Losses in Making Dies and Templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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Give Greater Production

- Made of finest quality steel
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— wavy or raker
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- The same high quality as in Griffin Power and Hand Hack Saw Blades

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HACK AND COPING SAW BLADE SPECIALISTS SINCE 1880

JG-178

**your VICTOR
distributor**



**a good man
behind a good blade**

Yes, Sir, when it comes to knowing what blade to use on metal or non-metal cutting problems . . . your VICTOR Distributor's long experience more than qualifies him to help you out. An expert on hack saw blades, he'll be glad to show you how to cut metals and non-metals easier and faster, and cut costs too, with VICTOR Blades.



VICTOR'S Steelrite Metal Marking Crayons

Ask your VICTOR distributor about these new and improved metal marking crayons. Available in a variety of sizes, these crayons, made of genuine soapstone by special extrusion process, are uniform in strength and composition. Markings can be made on hot, cold, damp or grimy metal and withstand pickling, yet do not affect enamel application.

Don't forget to ask him for a free copy of the Victor Metal Cutting Book for your pocket or tool kit and the Victor Wall Chart for your shop . . . They'll help you get maximum efficiency from your metal cutting saw blades. Always keep your Victor line complete!

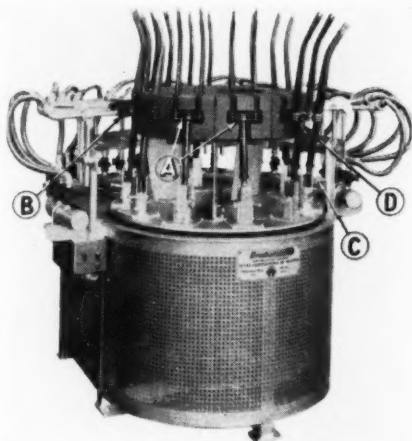


VICTOR

SAW WORKS, INC., Middletown, N. Y., U. S. A.

Makers of Hand and Power Hack Saw Blades,
Frames and Band Saw Blades

direction, the fork assemblies are carried through six heating stations. A temperature of 1750 deg. F. is maintained at the six stations; and each assembly is subjected to a total heat exposure of 12 seconds, the required time for brazing the parts. At **A** in the illustration, two fork assemblies are shown in position at the start of the brazing cycle; the first brazing burner station is shown at **B**; a device for trip-



Radian! gas machine designed for brazing bicycle forks.

ping brazed forks into unloading position is indicated as **C**; and a brazed fork ready for unloading may be seen at **D**.

The posts which support the assemblies may be adjusted in order to accommodate different lengths of bicycle forks. Pre-mixed gas and air are supplied to the burners of the unit in a constant proportion and at unvarying pressure; the gas consumption of the machine is approximately 210 cubic feet of 1000 B.t.u. natural gas per hour. The installation is equipped with the latest design Selas safety devices.

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SOLID TUNGSTEN CARBIDE END MILLS



**SINGLE END
STYLE WMS**



**DOUBLE END
STYLE WMD**

TOLERANCES
Shank $+.000$
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*Prompt quotes on end
mills of special sizes
and tolerances*

Willey's end mills, precision ground from solid tungsten carbide, will increase your runs and hence your production, when operating at normal speeds.

But to get the greatest increase, operate them twice as fast as you do your ordinary high speed steel end mills. Willey's end mills can take it! Shops equipped with Willey's cutting tools have an advantage in these days of competitive selling.

Write For New Catalog 449

Sixty-six pages of useful information covering Willey's entire line. Use your business letterhead, please.

WILLEY'S CARBIDE TOOL CO.

SOLE MAKERS OF WILLEY'S METAL

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Detroit 1, Michigan



The illustration shows a method of power brushing being used to clean a typical shovel blade.

Power Brushing Used for Cleaning Shovel Blades

IN the manufacture of long-lasting scoops and shovels, one of the most important operations is that of thoroughly cleaning the blades after the heat treating operation and prior to the painting operation. The American Fork and Hoe Co. of Conneaut, Ohio, manufacturers of this type of shovel equipment, is using a method of power brushing in performing the cleaning operation on a production line basis.

As may be seen in the accompanying illustration, the blades are brought in contact with the brushes by an offhand

method, the brushes being mounted on a polishing machine of the double spindle-V-belt drive type which is powered by a 5 h.p. motor. The brushing equipment is supplied by The Osborn Manufacturing Co. of Cleveland. Seven 18-inch diameter Monitor wire wheel brush sections filled with .0104 inch crimped wire are used. The brushes are rotated at a speed of 2400 r.p.m., and a typical cleaning operation may be completed in just 16 seconds. Thus, the blades may be cleaned at the rate of 18 dozen per hour, and approximately 7,000 blades may be cleaned before it is necessary to replace a set of brushes.

The scoop and shovel blades are made of 15 gage high carbon steel, and they are heat treated and hardened for extra strength. With the present method of brushing, all oil quench and heat treat scale, and accumulated rust and dirt are removed in preparing the blade surfaces for the application of an asphalt base paint.

FASTER TUBE AND PIPE CUTTING

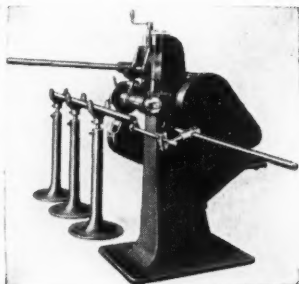
STEEN High-Speed pipe, tube and column cut-off machines embody unique design and rigid construction features to greatly step up cut-off operations. Available in three sizes to cut diameters $\frac{1}{8}$ " to 3"; $\frac{1}{8}$ " to 6"; 3" to 12".

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CONTINENTAL MACHINE CO.

1952 Maud Ave.

Chicago 14, Ill.



A NEW **INGERSOLL** *Shear Clear Cutter*

• CUTS TOOL COSTS • PRODUCES MORE
PER GRIND • LASTS LONGER

Ingersoll builds machine tools as well as cutters. Because our cutter engineers understand machine tool design problems through a close association with our machine engineers, they are able to build the best possible types of cutters to do the job on a wide variety of machines. Our representatives are well equipped to inform you on the recent developments in cutting tools. Here are a few facts about one new Ingersoll cutter which illustrate recent advances in cutter design and construction.

The New **INGERSOLL** Shear Clear Cutter

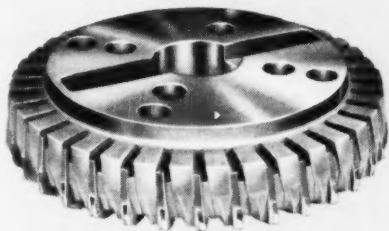
First: An experimental cutter was designed and developed by Ingersoll cutter engineers.

Second: The new cutter was production tested under actual operating conditions on an Ingersoll process machine in the shop of a large automobile manufacturer.

Third: Compared with previous tools, the new cutter operated at two-thirds the tool cost, and reduced down time from cutter changing to one-third the former total.

Fourth: The new cutter also decisively outpaced three late model competitive cutters on tool cost and down time from cutter changing.

Fifth: Because of the smooth operation of the new cutter, feed rate of the machine was stepped up from 44" to 60".

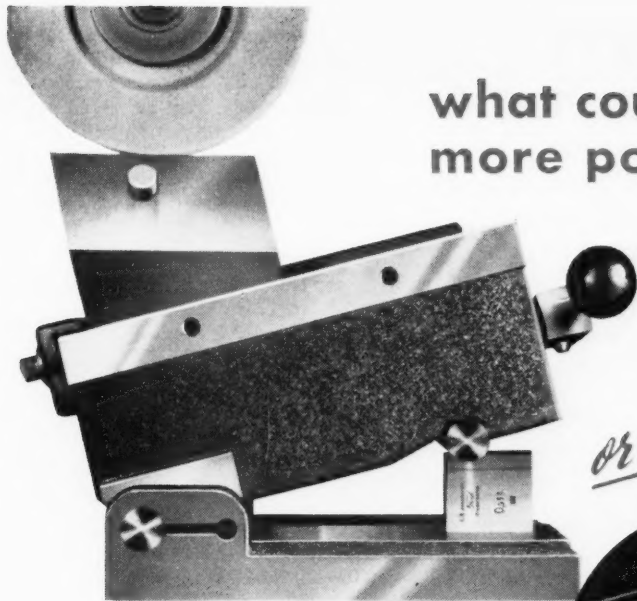


Other Ingersoll Cutters are Being Developed Along Similar Lines

Ingersoll cutters are used on all makes of milling and boring machines. Work is being done on different kinds of material for job shops as well as high production plants. A word from you will send an Ingersoll representative to discuss with you the latest developments in milling cutters. Write for Cutter Catalog No. 56A.

THE INGERSOLL MILLING MACHINE COMPANY • ROCKFORD, ILLINOIS

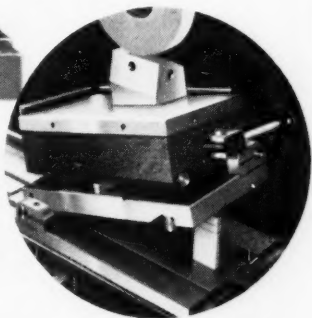




what could be
more positive...

or simpler?

The MAGNA-SINE for angular work



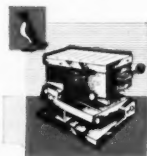
The Magna-Sine, used with standard gauge blocks, is the only positive shop method of making fast angular set-ups. Plus this angular accuracy, the work piece is held securely, without distortion, by magnetic attraction on a permanent-magnet chuck.

The Magna-Sine—except magnetic parts—is made of hardened, seasoned steel and all gauging surfaces are ground and lapped flat and square for positive accuracy from every set-up.

Set-ups are made by inserting standard

gauge blocks between the plates of the Magna-Sine. The proper blocks are indicated for all angles in the Table of Constants furnished with every unit. No dials to go out of adjustment; no scales to mis-read . . . no parts to move or go out of adjustment after the set-up is completed.

Write for descriptive bulletin which gives full details and prices on these versatile units. Thousands are in daily use.



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Manufacturers of the MAGNA-SINE and Other Precision Tools

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MAGNESIUM SAFETY TONGS

The Answer to Safety and Efficiency in Punch Press Operation

- • light as cardboard.
- • durable as steel.
- • minimum injury to dies when caught in press.
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Because of the inherent lightness of Magnesium, it is now possible to make these tongs long enough to keep the worker's hands completely out of danger. Particular attention is given to the hand grip on all tongs to insure against abrasions when used on highly repetitive work.



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Length 10½ in.
Wt. 5 oz.



No. 666

Length 11½ in.
Wt. 5 oz.



No. 444

Length 11½ in.
Wt. 6½ oz.



No. 333

Length 10½ in.
Wt. 6½ oz.

Very low price in quantities. Write direct for catalog and prices if your regular supplier does not handle. Dealers wanted.

**NORTHERN TOOL
& DIE ENGINEERING**

FLINT 5, MICHIGAN

A, was machined to fit over the cross slide, and the plate was held in position by means of two set screws, B. Another plate, C, was mounted on A and held in position by means of two dowel pins, D.

The piece to be milled is shown in dotted lines and is indicated as E. The

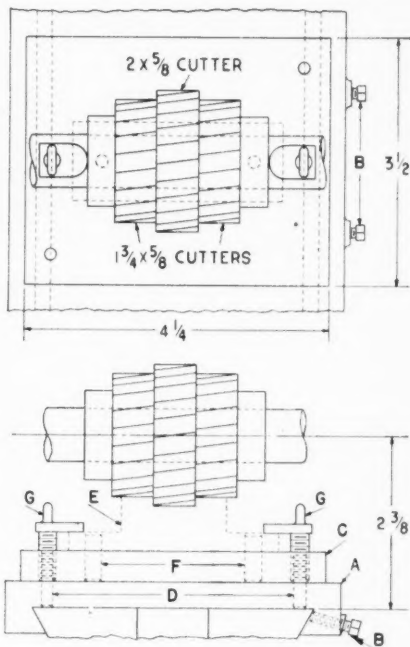
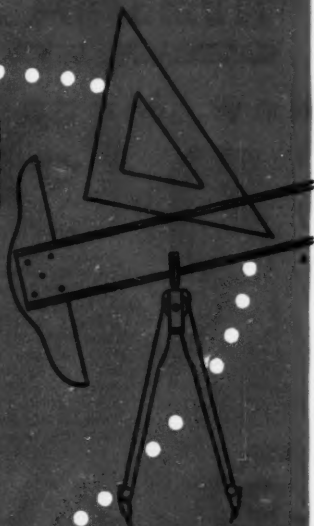


Fig. 2—Set-up for machining the top surfaces of the part shown in Fig. 1.

part was positioned on plate C by locating the holes in the part over dowel pins F. The piece was then held securely on the plate by means of flanged clamping screws, G. It may be noticed that on each of these screws, one side of the flange was machined away. Thus, only a 180 deg. turn was required to either clamp or unclamp the work. A set of milling cutters, consisting of one 2 x 5/8 inch cutter and two 1-3/4 x 5/8 inch cutters, was mounted on an arbor



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are given in Ex-Cell-O Bulletin 46262. Write Ex-Cell-O in Detroit for your free copy.

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New Model 70

Multi-Wheel Numbering Machine

Machine and Shank All One Piece.

The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Model 70 NUMBERALL Machines are used in all industries to mark various parts. Stamps numbers, etc., quickly . . . neatly. Perfectly aligned. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20.

Bulletin MS-70.



IMPROVED TYPE HOLDERS

Hand or Press style. Type can be easily, quickly loaded and unloaded. Simplest construction . . . Just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: 1/32" up to 1/2" figures and letters.

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MS23H



Steel
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NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

and positioned on the lathe centers. The lathe was then started, and the work was fed in on the cross slide. As the piece passed under the milling cutters, the top surfaces were machined.

The method of machining the remaining surfaces is shown in Fig. 3. Clamps **G** were removed; and, to hold the work, angle brackets **H** were

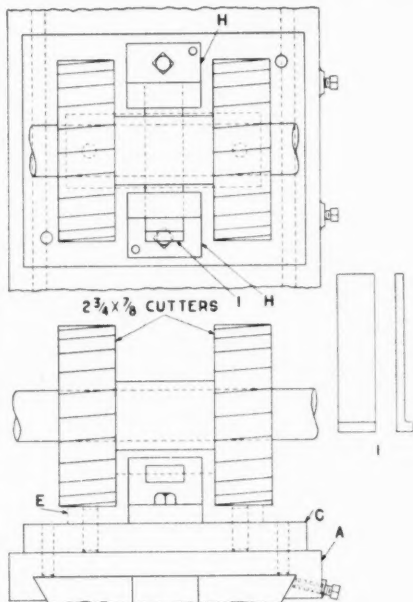


Fig. 3—Set-up for machining the remaining surfaces of the part shown in Fig. 1.

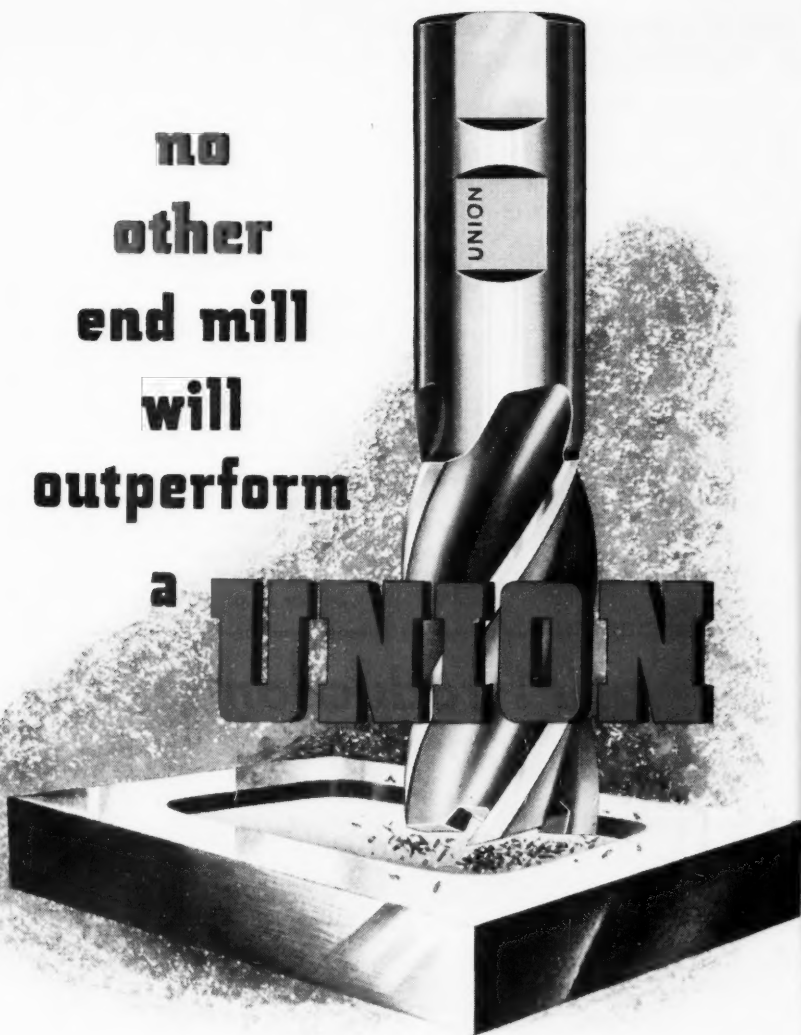
screwed into plate **C**. A hold-down plate, **I**, was fitted between slots in bracket **H** to hold the work securely. Two 2-3/4 x 7/8 inch cutters were mounted on an arbor and positioned on the lathe centers; the lathe was started; the work was fed in; and the remaining surfaces were machined.

The machining methods described here enabled this company to perform milling operations successfully with a rather unconventional method and at a low production cost.

**no
other
end mill
will
outperform**

a

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His name is listed in Union's THOMAS' REGISTER insert under the heading "Drills, Twist".

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MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.

BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

An Adjustable Tool for Finishing Ball Seats

By ROGER ISETTS

THE tool shown in the accompanying illustration may be used for finishing spherical ball seats smoothly and accurately. This tool is rigidly constructed; and it may be adjusted for wear and, within limits, for size.

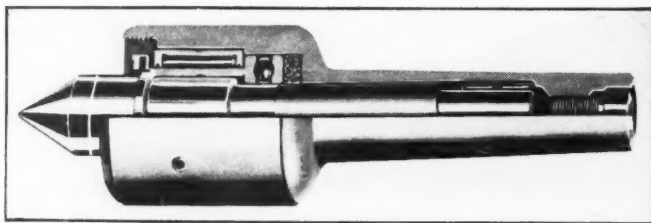
The tool body, **A**, is made from a round section of hardened and ground tool steel. One end of the body is machined to a semi-sphere, as shown; and a slot, **B**, in which a cutter may be inserted, is milled in this end parallel to the body axis. Perpendicular to the milled slot and slightly off-center, a hole, **C**, is drilled, counterbored, and tapped to receive a socket head holding screw. Another hole, **D**, is drilled and tapped at a 45 deg. angle to the body axis to receive a cutter positioning screw.

The opposite end of the body is tapered so that it may be fitted into a machine spindle, and the center portion of the body is threaded, as shown at **E**. Two adjusting nuts, **F**, which serve as stops to control the depth of the cut, are positioned on this threaded portion.

The cutter, **G**, is made from a round section of hardened high speed steel, and it is made just wide enough to be slipped into the slot in the tool body. The cutter is specially designed and machined so that a pie-shaped section is removed; so that a flat section, **H**, is machined at one side of this pie-shaped portion; so that there are two radii, **X** and **XX**, which blend into each other; and so that a hole is drilled through which the holding screw may be inserted. The radii are ground so that radius **XX** is about 1/32 inch larger than radius **X**.

To ready the tool for machining, the cutter is slipped into the body slot and

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These Ball and Roller Bearing Centers with the Exclusive OVERLOAD INDICATOR increase production, because work or centers will not burn out, regardless of how long the run. Well-engineered to provide years of trouble free service, even under most severe conditions.

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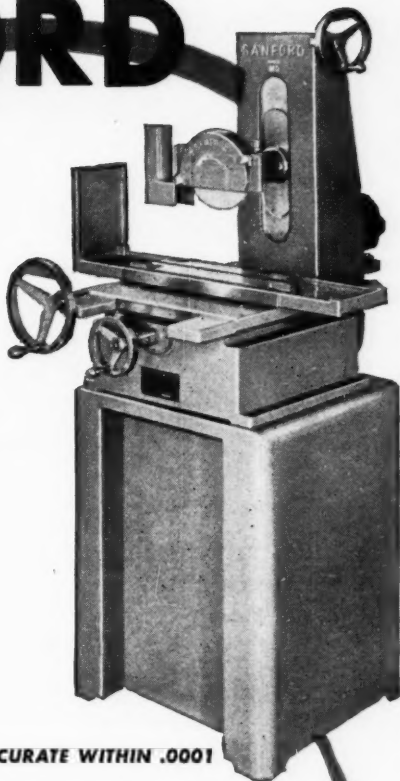
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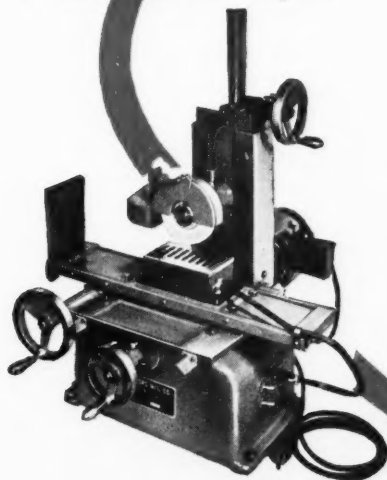


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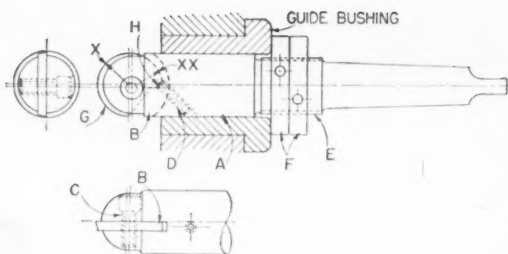
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positioned, the socket head screw in hole C is tightened, and then the cutter holding screw in hole D is tightened. As the cutter wears, or as it becomes necessary to increase the size of the hole being cut, the cutter holding screw may be advanced until the correct radius is obtained.

A Method for Spacing Slitter Rolls

By WALLACE C. MILLS

A QUICK and accurate method for positioning a number of slitter rolls so that they are all the same distance apart is described herewith. The rolls are used to shear sheets of metal into strips of equal width, and the method described is used instead of actually measuring with a scale the distance between rolls.

As shown in Fig. 1, each roll is positioned and set by lining up one side of the roll with the side of a notch cut

into a strip of sheet metal placed directly below the rolls. Since the notches are exactly the same distance apart, the rolls will also be exactly the same distance apart; and the operator uses his sense of feel to set the rolls.

The die shown in Fig. 2 is used to notch the sheet metal strip. The main

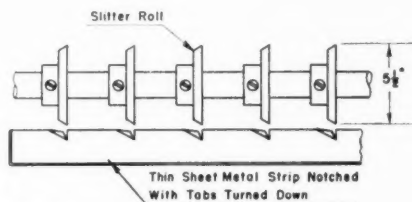


Fig. 1—Diagrammatic sketch showing method of positioning slitter rolls.

parts of the die consist of a base plate, A, in which a slot, B, is cut; a work aligner, C, which is screwed into the base; and an adjustable stop, D, which is positioned in the base slot and held in place by means of a thumbscrew. The die is used in conjunction with punch P.

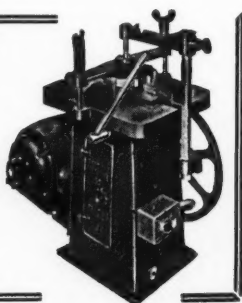
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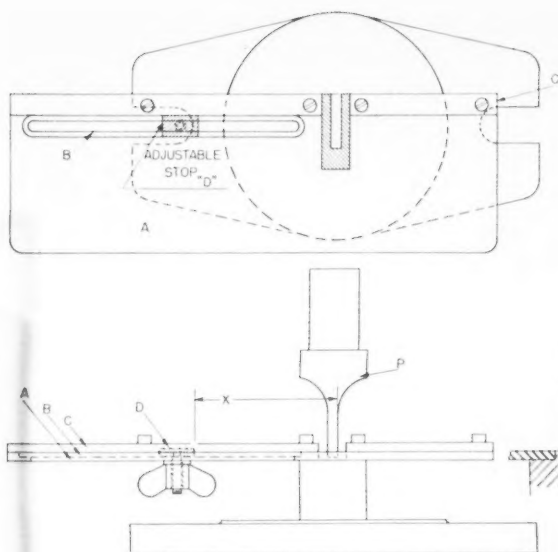


Fig. 2—Die in which sheet metal strips are notched.

the required number of notches are punched. The distance between notches and, therefore, the distance between rolls may be changed by changing the position of the adjustable stop.

To use the die, the adjustable stop is first set so that the distance between the front side of the stop and the front side of the punch, a distance indicated as *X* in Fig. 2, is equal to the required distance between notches in the strip. The strip is fed in line with the work aligner until the end of the strip rests against the adjustable stop. The punch is then actuated, and the first notch is made. The strip is moved forward until the side of the notch rests against the stop, and then the strip is notched again. This process is repeated until

A Simple Method for Aligning Milling Machine Cutters

By MICHAEL AXLER

THE following method is suggested for aligning milling machine cutters which are used to cut keyways and slots. As an example, we will say first that a keyway is to be cut in a shaft. The shaft is held in a vise on the milling machine table, as shown in Fig. 1, and a toolmaker's square is set against the shaft. The cutter is lined up against the side of the square and then the



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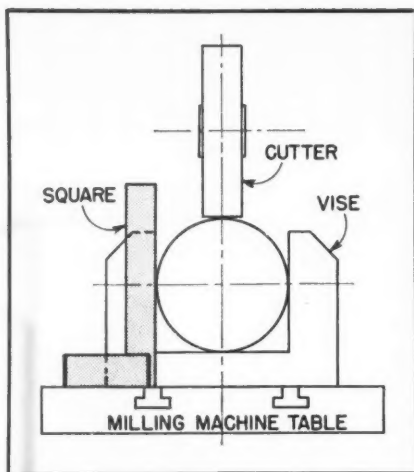


table is moved the required distance (the shaft radius minus one-half the cutter thickness) and a small cut is taken. If the work is the least amount out of line with respect to the cutter,

Fig. 1—Milling cutter is lined up with a toolmaker's square to cut properly aligned keyways in shaft.

the operator will see that an imperfect keyway is being cut, not parallel to the shaft axis, so the table is moved a slight amount to compensate for this condition. By means of this method it is possible to obtain accuracy to within .001 inch of the shaft axis.

Another example of lining up a cutter with a toolmaker's square may be seen in Fig. 2. In this case, it is necessary to mill two slots, $\frac{1}{2}$ inch wide and $\frac{1}{4}$ inch deep, in the top surface of a square steel block. The block is held on the table, and the square is set on the table against the block. The cutter is lined up against the square, and then the table is moved 0.250 inch to cut the first slot. After the first slot is completed, the table is moved 0.750 inch; and the second slot is cut. This method assures that the slots will be in line with each other and that they will be in line with the side of the block.

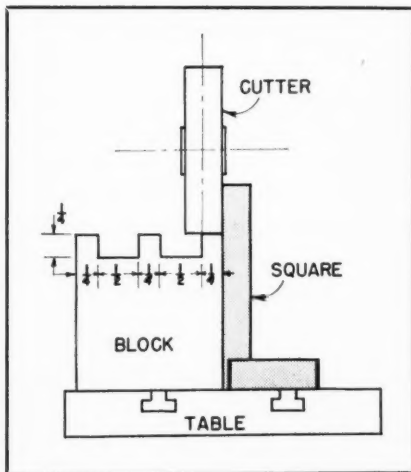


Fig. 2—Milling cutter is lined up with square to cut slots in steel block.

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News of the Industry

Taaffe Elected Vice President of Cincinnati Lathe and Tool Company

Griffith C. Taaffe, sales manager of Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio, a subsidiary of The Cincinnati Milling Machine Company, has been elected a vice president of the Lathe Company. Mr. Taaffe became associated with The Cincinnati Milling Machine Company in 1935. Previous to that time he had spent some six years with the Cincinnati and Buffalo plants of the Worthington Pump Corporation in various capacities.



Griffith C. Taaffe

Starting with The Cincinnati Milling Machine Company in September 1935 Mr. Taaffe worked in various phases of industrial engineering in the planning department as a time study and methods engineer and in the development of experimental machining production methods, and so on. Later experience included sales engineering work, production estimating on customers' work, and as supervisor of the division producing auto-

matic milling machines. During the war he acted as technical advisor to the Tools Branch of the War Production Board, Washington, D. C., and subsequently established and operated the Washington, D. C. office of Cincinnati Milling and Grinding Machines, Inc. He later became manager of all field service and demonstration work and during 1946 acted as special assistant to the sales manager of Cincinnati Milling and Grinding Machines, Inc. In January 1947 Mr. Taaffe became general sales manager of Cincinnati Lathe & Tool Company, which position he continues to hold.

Marshall Steel Company Moves to Larger Quarters

Marshall Steel Company, formerly of Lisle, Illinois, has moved to a new building in McCook, Illinois, just outside of Chicago. This expansion was necessary to increase the present facilities and provide a broader service throughout the entire country.

A large group of Mattison grinders will enable the company to produce ground flat tool steel of three kinds: water quenched, oil quenched, and air quenched. The company is also now better equipped to produce special precision ground parts such as shear blades, wear plates, ink fountain knife blades, machine parts, and so on. The central location of the new plant permits shipments to be quickly made to any part of the country.



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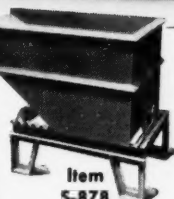
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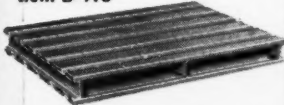
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Promotions in Top-Level Management Announced by Minnesota Mining

Five promotions in top-level management of the Minnesota Mining & Manufacturing Co., St. Paul, Minn., have been an-



Richard P. Carlton (left) and William L. McKnight

nounced. William L. McKnight, president of the firm since 1929, has been elected to the newly created post of chairman of

the board. His successor to the presidency is Richard P. Carlton, former executive vice president in charge of research, engineering and manufacturing. Archibald C. Bush, former executive vice president and director of marketing and distribution, becomes chairman of the executive committee.

Two new executive vice presidents have also been named. They are George H. Halpin and Herbert P. Buetow. Mr. Halpin, former vice president for sales, will continue to direct sales activities. Mr. Buetow, 3M's treasurer since 1939, becomes executive vice president in charge of finance.

Cincinnati Electrical Tool Acquires Hisey-Wolf Machine Company

Acquisition of The Hisey-Wolf Machine Company, 53-year-old Cincinnati manufacturer of industrial grinding machines and buffing and polishing lathes, has been announced by officials of The Cincinnati Electrical Tool Co., 2625 Madison Rd., Cincinnati 8, Ohio. All products of both companies will now be manufactured in the modern plant of Cincinnati Electrical Tool, where production of the Hisey-Wolf line of more than 200 models will continue under the old trade name.

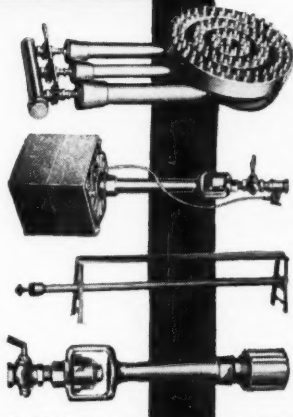
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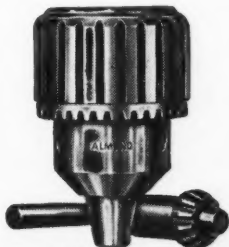
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Tomkins-Johnson Sales Representatives Hold Conference at Company Plant

A group of 38 sales representatives of The Tomkins-Johnson Company met recently at the company's plant and general office in Jackson, Michigan, to discuss plans for the fall and winter months. During the course of the meeting the salesmen were shown a new line of air cylinders and a new improved "Clinchor" for setting clinch nuts. Those attending the meeting are shown in the accompanying photograph.

American Pullmax Company Formed

A new company, American Pullmax Company, Inc., has been formed to handle the sales and service of the new Pullmax sheet steel and plate cutting machine. A complete line of machines and accessories, as well as spare parts and a service department, will be maintained in Chicago by the company, officers of which are Stellan Bendz, president, and E. G. Kilhstrom, sales manager. Offices and display rooms of the company are located at 2627 N. Western Ave., Chicago 47, Illinois.



(First Row)—Wm. Maier, G. Spack and J. Siegel, A. C. Haberkorn Machinery Co., Detroit, Mich.; H. Berg, Industrial Steels Inc., Cambridge, Mass.; C. Richardson, Weldon Engineering Co., Chicago, Ill.; Wm. Remund, sales mgr., Mrs. J. Rex Elder, v.p. & g.m., A. R. Johnson, pres., R. Elder, ass't g.m., and A. Howland, ass't sales mgr., The Tomkins-Johnson Co., Jackson, Mich.; A. Conrad, Weldon Engineering Co., Chicago, Ill.; F. Magyar, S. G. Morris, Cleveland, Ohio.

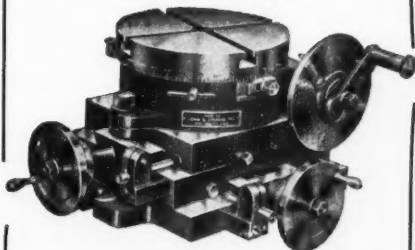
(Second Row)—J. A. Bouslough, Pittsburgh, Pa.; W. Fluke, Industrial Steels Inc., Cambridge, Mass.; R. Rankin, W. A. Rankin, Philadelphia, Pa.; G. Schliecker, Tri-Line Corp., Buffalo, N. Y.; W. Rankin, W. A. Rankin, Philadelphia, Pa.; L. Charbonneau, Charledge Sales, Detroit, Mich.; A. Andrews, Jr., A. B. Andrews, Jr., Raleigh, N. C.; C. Hallet, S. G. Morris, Cleveland, Ohio; G. White, Geo. T. White Co., Walkerville, Ontario, Canada; T. Rutledge, Charledge Sales, Detroit, Mich.

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(Fourth Row)—J. Sudduth, J. T. Sudduth & Co., Birmingham, Ala.; L. N. Wood, Moehlenpah Eng. Inc., St. Louis, Mo.; W. Bielefeldt and P. Miller, J. H. Sipchen Co., Chicago, Ill.; C. Bossong and W. Deas, Henry M. Wood Co., Cincinnati, Ohio; S. G. Morris, S. G. Morris, Cleveland, Ohio; W. Hunter, Ralph W. Atkinson Co., Los Angeles, Calif.; R. Pearce and R. Earl, G. M. Pearce Co., Newark, N. J.; G. Baldwin, S. G. Morris, Cleveland, Ohio; A. Reichert and H. Tenney, Beeson-Faller-Reichert, Inc., Toledo, Ohio.

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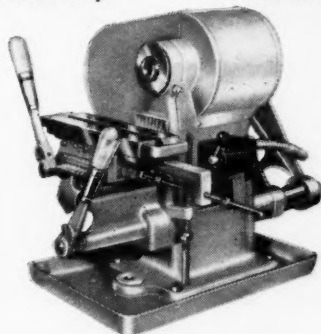
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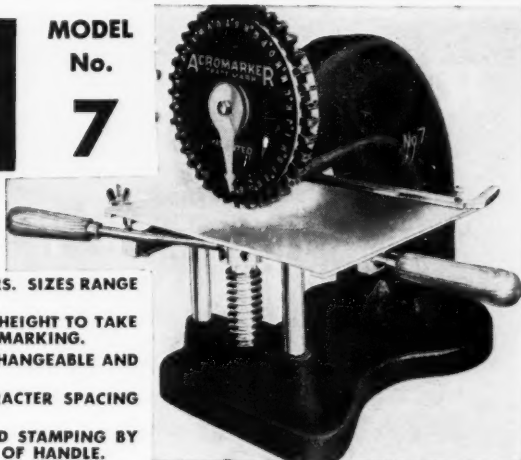
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A. H. d'Arcambal Receiving 30-Year Service Pin from F. U. Conrad, President and General Manager of Niles-Bement-Pond Company

A. H. d'Arcambal Celebrates 30th Anniversary with Pratt & Whitney

Alexander H. d'Arcambal, vice president and sales manager, Small Tool and Gage Division, and consulting metallurgist of Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn., recently observed the 30th anniversary

of his association with the company. Joining Pratt & Whitney as chief metallurgist in 1919, Mr. d'Arcambal directed the program of the company in metallurgical developments applying to machine tools, cutting tools and gages. He also directed all of the metallurgical work pertaining to the P & W aircraft engine during the development of that product.

In 1945, Mr. d'Arcambal went to Europe as a member of the "Metallurgical Mission to Germany" to inspect processing used by the Germans in their cutting tool and gage plants. Mr. d'Arcambal graduated from the University of Michigan in 1912 and is a past national president of the American Society for Metals and also the American Society of Tool Engineers. He is also a member of the American Society for Steel Treating.

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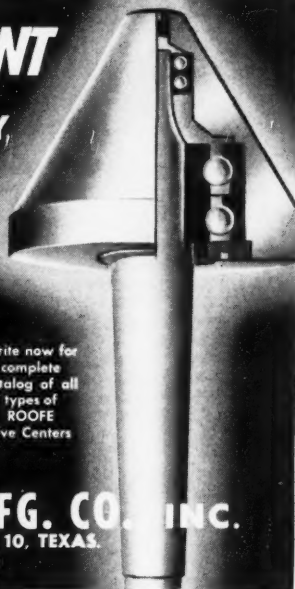
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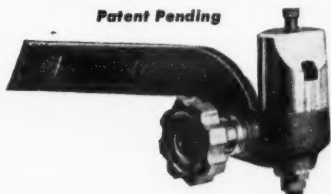
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blades. Simply remove high-
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Anderson Carboloy Tipped
Blade. Available in three
widths.

by Anderson

**THEY LAST 8 TO 10
TIMES LONGER**



Send for Bulletin 11-22

ANDERSON BROS. MFG. CO., Rockford, Ill.

Hand and Power Hydraulic Presses, Balancing Ways, Roto Checkers, Hand
and Power Scrapers, Spotters.



Lodge & Shipley Discontinues Acme Turret Lathe Line

The Lodge & Shipley Co., Cincinnati, Ohio, recently announced a decision to discontinue the manufacture of the Acme line of turret lathes in order to devote its facilities to the continual development of an extended line of new Model "X" and Duomatic lathes. The company will continue to furnish repair parts and most turret lathe tooling for the Acme turret lathe built by the former Acme Machine Tool Company and by The Lodge & Shipley Company.

B. L. Waters

B. L. Waters, founder and chairman of the board of Lyon Metal Products, Inc., Aurora, Ill., died recently at the age of 74. Mr. Waters began the company in 1901 as a small sheet metal shop in Chicago. Shortly after starting the business, he was joined by his brother, Frank S. Waters, who died in 1935.

In 1906 the company expanded and moved to its present location in Aurora. Starting at that time Lyon expanded rapidly, broadening its field and introduc-

ing many new steel products. In 1928 the company, then known as Lyon Metallic Manufacturing Company, consolidated with the Durand Steel Locker Company and the firm name was changed to Lyon Metal Products, Incorporated.

For many years, Mr. Waters was active in every phase of the business. In 1935 he was elected president of the company and became chairman of the board on his retirement August 31, 1940.



B. L. Waters

Did You Know?---

The Hartford Special Machinery Co., Hartford, Conn., has announced the appointment of two new exclusive agents to handle its line of automatic drilling and tapping machines, swagers, thread rollers, and die polishing machines. Joseph Windheim, with headquarters in Rochester, N. Y., will cover the Buffalo-Rochester-Syracuse territory. Lloyd & Arms, Inc., 3818 Chestnut St., Philadelphia, will cover eastern Pennsylvania, southern New Jersey, Delaware, Maryland, northern Virginia, and the District of Columbia.

— o —

Milton T. Carleton, formerly works manager of the Cleveland Division of E. W. Bliss Company for 14 years, has been appointed works manager of The Cleveland Crane & Engineering Co., Wickliffe, Ohio, manufacturer of heavy overhead traveling cranes, Cleveland Tramrail overhead materials handling systems, and Steelweld shears and bending presses.

— o —

Three branch sales offices of New Departure, Division of General Motors Corp., Bristol, Conn., have recently moved to the following new locations: 937-A Park Square Bldg., 31 St. James Ave., Boston 16, Mass.; 1357 W. 18th St., Indianapolis 2, Ind.; and 1716 Fourth St., Berkeley 10, California.

— o —

Warren J. Hannum, formerly associated with the Gisholt Machine Company and later with the Libby Division of International Petrola Corporation, died recently at the age of 65.

New AUTODRILL

A Production Machine Tool
Gives Correct Speed and Feed



Variable spindle speed. 4" stroke (or more). Rapid spindle travel to work. Accurate depth stop. Controlled in feed. Rapid withdrawal. For drilling, tapping, reaming, etc.

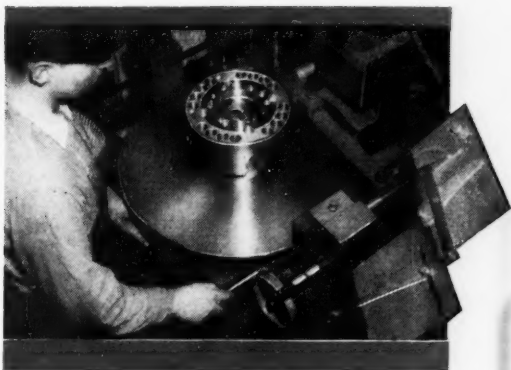
Write for complete folder.

AUTO TOOL & ENGR. CO.

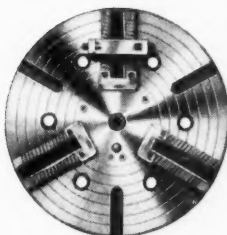
2908 Armitage

Chicago 47, Ill.

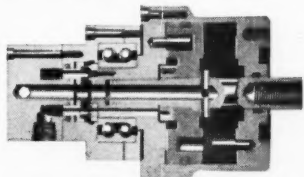
**Super-smooth
High speed OPERATION
OF CHUCKS AND AIR
CYLINDERS with -----**



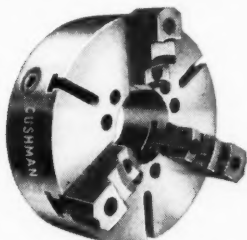
CUSHMAN *Static* BALANCING



CUSHMAN "ACCRA LOCK"® POWER CHUCK



CUSHMAN ROTATING AIR CYLINDER



CUSHMAN WRENCH OPERATED CHUCK
"Accralock" Registered Trademark

Today, with the increasingly high speeds at which precision machine tools are operating, it is essential that vibration and chatter be eliminated from work holding and control equipment.

With Cushman Power and Wrench Operated Chucks . . . and with Rotating Air Cylinders, you are assured of a new degree of smoothness in operation. This is due to our accurate Balancing Checks throughout manufacture and after assembly of chuck bodies and cylinders. No product is shipped without a final static balance test . . . using the Gisholt Static Balancing Machine illustrated above. We believe this feature to be of great value to buyers of Cushman equipment to be used either for manual or power chucking. Bulletins on request.

THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut

Consult
CUSHMAN

Chucking Engineers Since 1862

12CB48

Did You Know?---

Lloyd A. Hatch, vice president formerly in charge of the roofing granule division of the Minnesota Mining & Mfg. Co., St. Paul 6, Minn., has been assigned to the job of coordinating research and new product development for the company. **Clarence B. Sampair**, vice president in charge of production, has been given added responsibilities which include labor relations. **C. P. Pesek**, vice president in charge of engineering, will now also be in charge of all company property.

— o —

A new corporation, **Mid-States Welder Mfg. Co.**, 6025 Ashland Ave., Chicago, Ill., has been formed to take over the manufacture of the lines of welding equipment formerly produced by the Mid-States Equipment Corp., Chicago.

— o —

The **E. W. Bliss Company** has announced that its Detroit district sales office is now located in the Fisher Building, Room 2214.

— o —

Emerson D. Ogle has been appointed manager of the industrial sales department of **SKF Industries Inc.**, Philadelphia, Pa., succeeding **C. D. Cummings**, who has resigned.

The **Whiton Machine Co.**, New London, Conn., has announced the appointment of **Jack Brewer**, manufacturers' representative, 1060 S. Broadway, Los Angeles 15, Calif., as its exclusive representative on the sale of lathe chucks, centering machines, special purpose high production milling machines, and gear cutting machines in south California.

— o —

Morehead Patterson, chairman of **American Machine & Foundry** of New York, and **Paul Gardner**, president of **DeWalt, Inc.**, Lancaster, Pa., recently announced that the two corporations have executed an agreement providing for the acquisition of all of **DeWalt's** properties and assets by **American Machine & Foundry Company**. **AMF** intends to continue the operation of the **DeWalt** plant at Lancaster with the same personnel.

— o —

To render better service to European owners of **Clearing presses**, as well as to make authoritative information quickly available to prospective buyers, the **Clearing Machine Corp.**, Chicago, Ill., has appointed **George A. Pockels** as director of European operations, with headquarters in Paris.

CARROLL AND JAMIESON LATHES

16"



12 Speed Geared
Head Motor Drive
Timken Mounted
Spindle.

Modern Design—
Liberal
Dimensions.

Write
for
Bulletin.

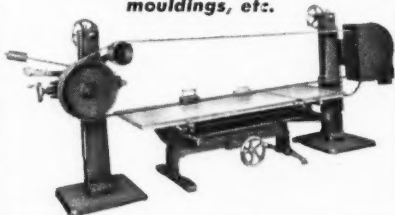
THE CARROLL & JAMIESON MACHINE TOOL CO.

SATAVIA • OHIO, U. S. A.

"OLIVER"

Belt Surfacacer and Polisher

for finishing surfaces of plates,
ornamental metal, metal
mouldings, etc.



The three units — each self-contained — are adjustable to handle work of any practical size. Has rubber-faced, turned aluminum ball bearing pulleys. Noiseless direct motor drive with reversing switch.

Write for Bulletin No. 183M

OLIVER MACHINERY COMPANY

Grand Rapids 2, Mich.

Did You Know?---

Ben F. Bregi, executive engineer with the National Broach & Machine Company of Detroit, accompanied by **Charles C. Clinton**, sales engineer in the same organization, left the United States recently for an extended visit with automotive, machine tool, and marine engine manufacturers in Great Britain, France, Holland, Switzerland, Sweden, Italy, and Western Germany where Mr. Bregi will lecture on modern methods of gear manufacture before organizations of engineers and production men in all chief industrial centers of Europe.

— o —

The **Link-Belt Co.**, Chicago 1, Ill., manufacturer of chains, elevators, conveyors, and power transmitting machinery, has announced the formal opening of its modern new manufacturing plant built on a 10-acre plot of ground at 3203 S. Wayside, Houston, Texas.

— o —

Joseph B. Clough, formerly vice president and sales manager of Johnston & Jennings Company, has been named vice president of Godfrey Tool & Supply, Inc., 10012 Carnegie Ave., Cleveland 6, Ohio, distributor for several manufacturers of cutting tools and special industrial products.

— o —

The **Bullard Co.**, Bridgeport 2, Conn., manufacturer of machine tools, has announced the appointment of **M. K. Peck** to supervise and activate sales of the recently acquired Bullard-Universal horizontal boring machine line.

— o —

Buffalo Pumps, Inc., Buffalo 5, N. Y., has announced the election of **Henry D. Wilson**, factory manager, and **Bruce W. Ellis**, chief engineer, to the board of directors.

— o —

The Detroit branch office and warehouse of **Bay State Abrasive Products Co.**, Westboro, Mass., is now located at 880 Lawndale Ave., Detroit 9, Mich., where larger quarters are offered for increased stocks plus a new grinding wheel alteration service for the convenience of customers in the Michigan area.

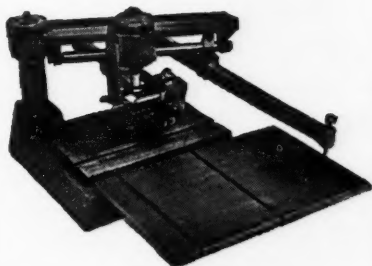
— o —

Montague-Harris & Company, dealer and distributor of metal-working machinery, has leased an 8,000 square foot building at 3509-3513 E. Olympic Blvd., Los Angeles, California.

— o —

Louis R. Ripley has been elected president of the Heli-Coil Corp., Long Island City, N. Y., maker of stainless steel screw thread inserts.

Solved! Your Engraving Problem



MODEL CC 3D

A versatile machine for contour milling, profiling and engraving. Covering far larger areas and selling at a lower price than any machine now available.



**Model
PE-1**

Variable Ratio Pantograph

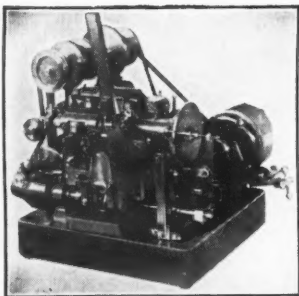
Engraves an area 5 by 5 inches on curved surfaces without special templates, with smooth lines in any design, number, letter; on iron, brass, copper, aluminum, soft steels and all plastics. • Drills a series of holes • Profiles small parts • Increases accuracy and production • Works from original drawing or templates • Etches glass and similar items • Will not cause distortion. For information and prices write Dept. M.

Consult your distributor or

AUTO ENGRAVER CO.

Florida Hill Rd.,

Ridgefield, Conn.



WALTHAM

Pinion and Gear Cutting Machines

with revolving cutter will make 1, 2 or 3 successive cuts for watch pinions or may be used for fine pitch gears up to 1 1/2" dia. Blanks are held and indexed by work spindle and usually supported by a tail center. Only straight teeth can be cut. Write for Bulletin No. 112.

WALTHAM MACHINE WORKS

WALTHAM

MASS.

Pinion and Gear Cutting Machine, Thread Milling Machine, Cylindrical Sub-Presses, Cutter Sharpening Machine, Small thread milling and gear cutters, Small special machinery.

Heavy Duty • Bench Type

ENGRAVING MACHINE

Interchangeable heads for engraving, electrical marking, and acid etching . . . available for all models. Also Panto engraving cutters, cutter grinders, master copy type, endless belts and accessories.



Write for
illustrated
catalog

The PANTO
MODEL UE-3
LIGHTER MODELS UE and UE-2

H. P. PREIS ENGRAVING MACHINE CO.

657 Route 29

Hillside, N. J.

Did You Know?---

The Denison Engineering Co., Columbus, Ohio, has announced the appointment of **Robert Krepps** to the position of district sales supervisor for the control and Multipress divisions of the company in the Midwest area, including the states of Illinois, Indiana, Wisconsin, Minnesota, Iowa, and Missouri. His headquarters will be at 11047 S. Hale Ave., Chicago, where Denison's Chicago representative, Melvin G. Sulser, is also located.

— o —

Dolan Industrial Sales, 318 Union National Bank Bldg., Houston 2, Texas, has been appointed representative to handle the distribution and sales engineering in southern Texas of broaching machines, broaches, broach sharpening equipment, and so on, produced by the Colonial Broach Co., Detroit 13, Mich. Dolan will also represent Colonial Bushings, Inc., Detroit 13, Mich., manufacturer of drill jig bushings and liners, in the same territory.

— o —

To expedite service and delivery to users of Morse cutting tools in the Detroit area, the **Morse Twist Drill & Machine Co.**, New Bedford, Mass., has opened a large modern warehouse at 447 W. Congress St., Detroit 26, Michigan.

— o —

The Farrel-Birmingham Co., Inc., has announced the appointment of **David Neill** as Cincinnati sales representative for gears, gear units, and flexible couplings manufactured in the company's Buffalo plant.

— o —

W. F. Rockwell, Jr., president of the Rockwell Mfg. Co., Pittsburgh 8, Pa., has announced the appointment of **A. P. Schmauch** as manager of industrial engineering.

— o —

E. O. Howard has been appointed sales engineer in the northern Illinois territory for the Grinder and Titan Abrasive Divisions of **Charles H. Besly & Co.**, Chicago, Ill. For the past eleven years, Mr. Howard has been manager of the Buffalo, New York territory for Besly.

— o —

Russell & Olson Co., 15815 James Couzens Highway, Detroit 21, Mich., has been appointed exclusive agent in the Detroit-Toledo and Michigan areas for the line of electric and pneumatic drills, nut setters, screw drivers, buffers, polishers, grinders, scalers, rammers, and chippers produced by the Rotor Tool Co., Cleveland 12, Ohio.

Did You Know?---

The Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., has announced the appointment of **H. S. Peters** as its central district sales manager with headquarters in Detroit, Michigan, to succeed the late **A. E. Ulrich**.

— o —

S. J. Woodworth has been appointed sales manager of the Wright Hoist Division of American Chain & Cable Co., Inc., with headquarters at York, Pa. He succeeds **A. R. Haskins** who has resigned to establish a business in Milwaukee, Wisconsin.

— o —

Leading industrialists of New England, customers of the **Austin-Hastings Co., Inc.**, 226 Binney St., Cambridge 42, Mass., are receiving copies of a 40-page linen bound book entitled "A Century of Progress" which provides an interesting account of the company's development since its founding in 1849.

— o —

J. F. Hawkins has been appointed district sales manager of the Detroit territory for the Page Steel & Wire Division of American Chain & Cable Co., Inc., with headquarters in the company's office in the General Motors Building.

— o —

Hauser Machine Tool Corp., Manhasset, N.Y., has been appointed exclusive U.S. representative for **Schaublin Ltd.**, Bevilard, Switzerland, manufacturer of tool-maker's lathes, turret lathes, repetition lathes, lead screw lathes, milling machines, automatic multiple drilling machines, and accessories.

— o —

Willam C. Howard, Jr. and **Walter E. Foreman** have been appointed field engineers by the Norton Co., Worcester 6, Mass., manufacturer of abrasive products and grinding machinery.

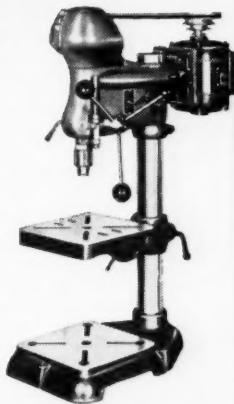
Machine Tools. A 16-page two-color Catalog B, published by the Walker-Turner Division, Kearney & Trecker Corp., Plainfield, N. J., presents illustrations, descriptions, specifications, and prices of a line of equipment for metal and wood-working, including band saws, drill presses, flexible shaft machines, jig saws, turning lathes, surfacers, tilting arbor saws, tilting table saws, jointers, motors, and grinders.

Mention **MODERN MACHINE SHOP** when writing to advertisers.

famco OFFERS A COMPLETE LINE OF **15" DRILL PRESSES**

**Today's Best
Drill Press
Value**

No. 80 Single Spindle, Tilting Table, Bench Model (shown with motor). Famco Drill Presses are available in a complete line of single and multiple spindle models, bench and floor types.



Here Are a Few of the Many Famco Features:

- Heaviest machine in the price field.
- Precision machined throughout.
- Extra-large (2-3/4" to 6-1/2") quill (largest in price field); greater rigidity, accuracy.
- Extra-long (4-1/2") stroke with shorter spindle means greater bearing support.
- No. 70 to 1-1/2" Jacobs Chuck or No. 1 Morse Taper.
- Four sealed-for-life ball bearings.
- Full-tilting, precision-ground table.
- Quick release motor bracket mounting (furnished as standard equipment) permits belt changes without moving motor.
- Easily adjustable feed tension control.
- Six spline spindle provides constant power and greater rigidity.

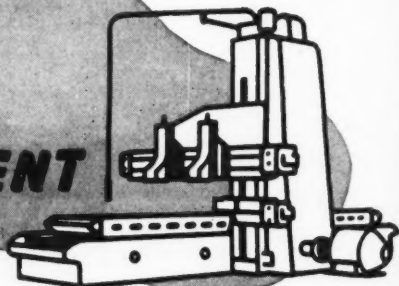
Write for new catalog just released!

FAMCO MACHINE CO.
1324 18TH ST. • RACINE, WISCONSIN

famco CUTTING **machines**

ARBOR PRESSES • DRILL PRESSES • POWER PRESSES
FOOT PRESSES • POWER AND FOOT SQUARING
SHEARS

NEW SHOP EQUIPMENT



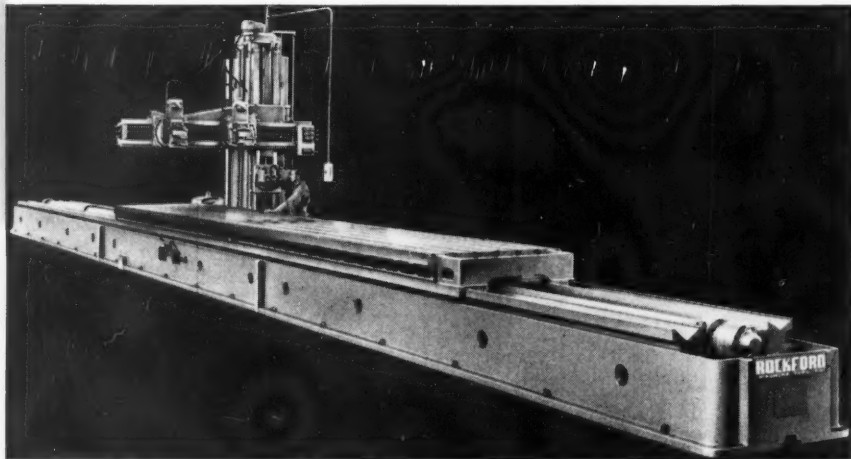
Openside Planer

The Rockford Machine Tool Co., Rockford, Ill., has added to its line of Hy-Draulic machine tools an openside planer with 33-foot cutting stroke. The planer is 73 feet long overall and approximately 14 feet high, and is provided with speeds that are infinitely adjustable up to a maximum suitable for carbide cutting tools. A unique advantage of the machine is the fact that the speed of the return stroke may be set independently of the cutting stroke speed so that a fast return stroke can be used to save time, regardless of what the cutting stroke speed may be.

The Rockford 60-Inch x 72-Inch x 33-Foot Hy-Draulic Openside Planer is built with two cross-rail heads and one side head. It has a maximum planing width for the right-hand head of 60 inches; the maximum planing width with the left-hand head is 72 inches. The maximum distance from the table to the rail is 72 inches.

Automatic Lathe

Ease and simplicity of setting up for any given job is a major advantage which is said to be provided by the "Clip-



Rockford 60-Inch x 72-Inch x 33-Foot Hy-Draulic Openside Planer

LeBlond "Clipper" Automatic High Speed Manufacturing Lathe with Normal Speed Geared Headstock

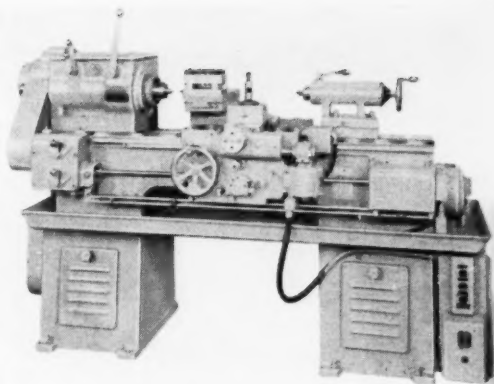
per," an automatic high speed manufacturing lathe introduced by The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. For the average turning and facing job, there are said to be no cams to make or change. Starting point is determined by the position of the micro-length limiting switch on the bed. Length of cut is determined by setting of the positive automatic length stop on the trip bar.

The machine is designed to operate automatically through a complete cycle: plunge to depth, turn, tool relief and rapid traverse to starting position. Operator attention is thus reduced to a minimum. The Clipper can also be used as a semi-automatic or manually-operated lathe.

With the completely automatic apron, a cross-feed mechanism moves the tool in and out electrically. A positive, adjustable stop on the bridge of the carriage is set for the desired depth of cut. Longitudinal feed toward the headstock is engaged by starting the machine. Tools feed to depth angularly and turning is then controlled by the regular feed mechanism. At the end of the cut, the apron engages a positive automatic length stop which actuates a time delay switch. In the interval, tools are relieved and the traverse mechanism returns the apron rapidly to the starting position. At this point, the apron contacts a micro-length return limiting switch which disconnects the entire circuit and stops the machine with tools in a loading position.

The option of any of three headstocks is offered. A regular anti-friction head, designed for medium spindle speeds, has two ranges of six selective speeds each: 68 to 400 r.p.m. or 102 to 600 r.p.m. A high speed anti-friction head has two ranges, each with six selective speeds: 200 to 1,200 r.p.m. or 250 to 1,500 r.p.m. A high speed motor head has the motor built into the headstock, stator bolted to the casting and the rotor pressed onto the spindle. This head is furnished with one of nine spindle speed combinations varying from 450 to 3,600 revolutions per minute.

Swing over the bed and carriage wings is 14 $\frac{1}{2}$ inches. The Clipper bed is fitted with hardened and ground steel bed ways front and rear. An automatic back facing



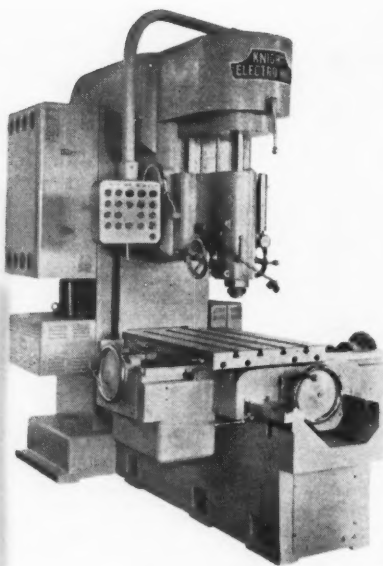
attachment, furnished as extra equipment, is coordinated with the apron to work in the regular automatic cycle. The attachment may be positioned anywhere on the bed. Power is derived from the feed rod through the driving mechanism. Pick-off gears vary the length of cross travel in relation to length feed of carriage.

Vertical Milling, Drilling and Boring Machine

Known as the "Electromill," a heavy duty vertical milling, drilling and boring machine which is designed to afford the user unusually wide latitude in selecting various features to meet his specific requirements has been introduced by the W. B. Knight Machinery Co., 3920 W. Pine Blvd., St. Louis 8, Mo. The machine may be equipped with variable speed motors for wide versatility or with constant speed motors for specialized production work, and can be changed when desired to suit changing work conditions on milling, drilling, boring, routing, jig and fixture, experimental, or production work.

The extra sturdy table and saddle travel on rollers and are designed to eliminate overhang but are compact enough so that both the table and saddle handwheels can be operated simultaneously. The heavy ribbed base is said to provide ample support for the heaviest work. The column has an unusually deep throat and a uniquely designed spindle head with extra long quill that provides the Electromill with an unusual capacity.

A heavy V-belt drive and built-in flywheel with variable speed range are said to assure smooth operation. Speed and



Knight "Electromill"

feed changes are electronically controlled and are made by means of a very small knob. Speeds and feeds can be increased while the machine is in operation. A button is provided for instantly stopping the cutter.

Power feed to the table and saddle is completely controlled from a panel which the operator can move in an arc to any desired operating position. A lever type safety stop switch mounted on the bottom of the panel provides for the stopping of all power drives in the entire machine. Safety clutches are said to prevent possible jamming of the feed or overloading of the drive.

Ram-Type Broaching Machine

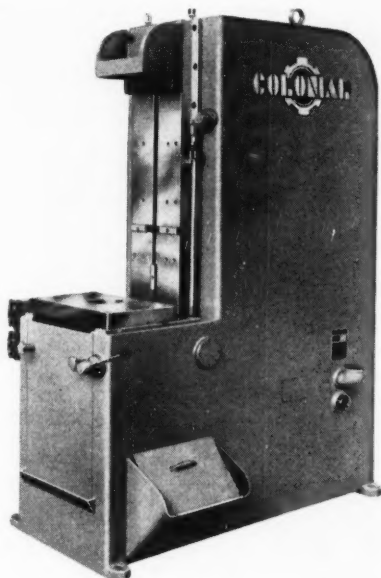
Known as the "Ram-Press," universal ram-type hydraulic broaching machine announced by the Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich., may be used interchangeably for all conventional broaching operations, including surface broaching, internal push-broaching, slotting, and press work. The machine is available in 4, 6 and 10-ton capacities in 24 and 36-inch strokes.

The column of the machine is of heavy steel welded construction with hardened

and ground ways the full length of the column for the ram slide. The hydraulic system is said to provide excess capacity for occasional overloads. Cylinder construction is such as to simplify maintenance and enable replacement of cylinders separately from the ram, if necessary. Piston rods for operating the ram are located in a protected position from chips or foreign matter. Pistons are of close grain cast iron with automotive type rings for long life.

The coolant system has its own separately motorized impeller type pump. Separate start and stop controls are provided for the coolant and hydraulic pumps. Stroke adjustments can be quickly and accurately made by means of externally located collars on the trip rod located alongside of the ram. These controls provide for automatic stopping of the machine at top and bottom of strokes.

A large bracket bolted to the ram face is designed for use in internal push-broaching and for single or multiple assembly and press work, as well as other operations. Manual operating controls are simple and practically foolproof in operation. Said to be ideally suited for shops where job runs of parts are to be put through, the machine can be furnished

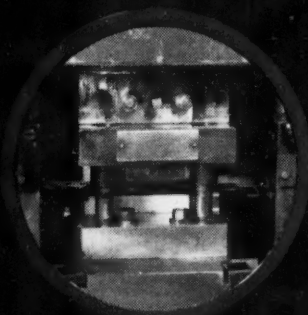


Colonial "Ram Press"

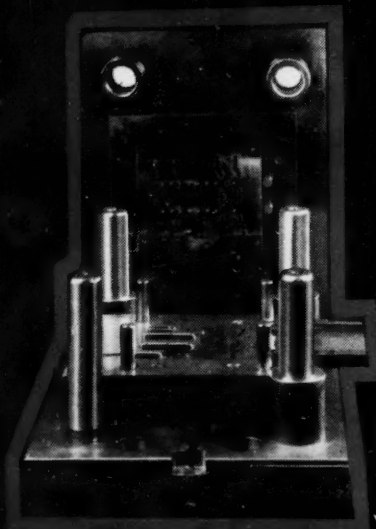
Long range stamping program protected with

DANLY

PRECISION DIE SETS



Close up view of the die installation in the press. Continuous fed strip stock can be seen passing through the die, emerging at the left in processed form.



A Danly Precision Die Set protects the functioning accuracy of this complex die... at 160 strokes a minute.

WESTERN ELECTRIC SCHEDULES 75,000,000 PARTS FROM THESE TOOLS
... AT 300,000 PARTS PER GRIND!

Send for this Free Booklet



to see how Danly's special die set machining service can cut your costs still further.

Write to...

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue, Chicago 50, Illinois

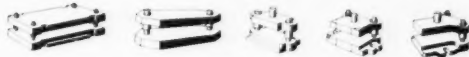
These dies made at the Hawthorne Works of the Western Electric Company are an example of a tough, complicated job of die making that pays off in terms of quantity production. Eight progressive stages change the coil stock into the finished stamping—"contacts" for step by step dial telephone equipment. One set of dies and one press do work which would otherwise take several setups.

To maintain the required close clearances between punch and die, this important set of dies is protected by a Danly Die Set. This prevents premature tool wear and objectionable burring—an important consideration where parts receive no final finishing.

Safeguard Future Production

Only when the diemaker's precision is completely safeguarded by the die set can future production be predicted. Long range scheduling is necessary in the Electrical Industry where the output of contacts, switches, laminations and like parts number into millions. Quantity lots are standard—long range production from a set of dies must be counted on.

Danly Precision Die Sets are one important reason why customers can get the maximum number of parts per grind and can accurately predict total production. That's why it pays off to specify "Danly Precision" on Standard or Special Sets.



Over 25 years of dependable service to the stamping industry

with special circuits for operating receding tables or fixtures where demanded by certain surface broaching operations. Special circuits can also be furnished for automatic clamping.

Contour Saw and Band Filer

An all-purpose combination contour saw and band filer has been announced by the Boice-Crane Co., 937 Central Ave., Toledo 6, Ohio. Described as ideal for cutting, filing, and file broaching small-run production parts, maintenance parts,

irregular shaped stacked parts, spiral parts, tools, templates, and stamping, forming and trimming dies, the machine is provided with speeds of up to 4,100 blade f.p.m. for cutting wood and other industrial materials and speeds ranging down to 92 blade f.p.m. for cutting tool, bar, and sheet steel, brass, aluminum, Transite, cast iron, and bronze and for filing a variety of metals. A quick-change, powerful ball-bearing equipped gearbox and step pulleys make any one of eight speeds instantly available. Cutting and filing speed data for a wide range of materials are given on an etched chart on the drive compartment door. Rapid filing

and absolutely flat work are said to be assured by the rigidity of the hardened steel file guide and backer-up which is supported above and below the table.

The precision machine cut helical gears of the machine operate in a constant bath of oil. The frame is of 10-gauge solid welded steel. The 15 x 15-inch heavy ribbed cast work table is mounted on two heavy cast trunnions, which are so designed as to simplify and speed up the insertion and removal of blades through a front table slit.

The special design Textalite disc wheels are mounted on sealed-for-life ball bearings, machine balanced for speeds in excess of 1,200 r.p.m. (4,100 blade f.p.m.), and include thick crowned, cemented replaceable tires of live rubber. Independently hinged doors, with bullet-type catches, cover the wheels and permit instant, unhampered access

WORN and OBSOLETE CUTTERS RECLAIMED

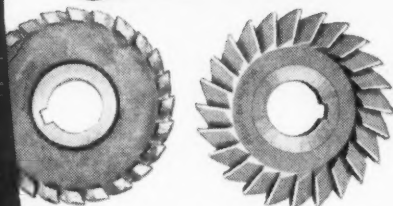
at low cost

**DRILL
HARDENED
STEEL**

UP TO 66-C

This is one of several quality standard carbide cutters made by National

Write for catalog



Typical National Salvage Job

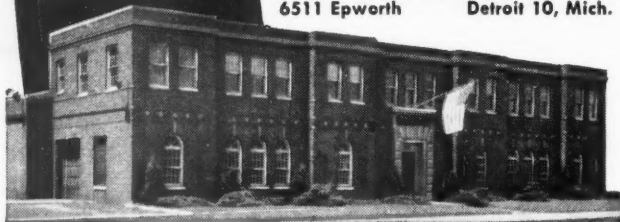
High Speed and Carbide Service

**Representatives in
all industrial areas**

**National
TOOL SALVAGE CO.**

6511 Epworth

Detroit 10, Mich.



NEW!

7" PRECISION SHAPER by SOUTH BEND

Fast... Accurate

This NEW 7" Precision Bench Shaper is an accurate and rugged machine tool. It is economical to operate and is readily adaptable to a wide variety of small work. Designed for industrial use, this shaper is ideal for any type of shop. Write for literature today. Time Payment Terms can be arranged.



SOUTH BEND LATHE WORKS

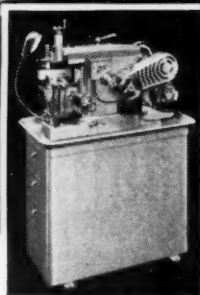
Building Better Tools Since 1906
427 E. Madison St., South Bend 22, Indiana

SPECIFICATIONS

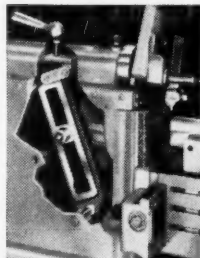
RAM — 0 to 7" stroke; 42 to 195 per min. 3 to 114 ft. per min. cutting speed.
TOOL HEAD — 3" vert. feed. 180° swivel.
TABLE — 5-7/16" x 5" x 6". Travel 9-1/2" horiz., 5" vert. 1/2" to 5-1/2" to ram. Six power cross-feeds .002" to .012".
WISE — Jaw width 4". Depth 1". Opens 4".

PRICES (f.o.b. factory)

7" Precision Bench Shaper . . . \$425
(Price includes light fixture, vise, drive unit, motor pulley, V-belts and switches. Stand and drive motor are extra.)
Steel Stand \$125
Motor — 1/3 h. p., 115 volt, 1 phase, 60 cycle, A. C. \$31.30



Steel stand for shaper with 3 drawers and built-in chip pan.

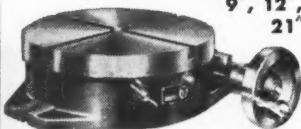


Rocker and crank assembly with graduated eccentric adjustment for ram stroke.

TROYKE ROTARY TABLES

**WORM WHEEL OPERATED
ROTARY TABLES**

9", 12", 15", 18",
21", 25"



**BALL BEARING STATION
INDEXING TABLES . . .**

12", 15", 18"



See your dealer
or write for
Catalog 14.

TROYKE MFG. CO.
Cincinnati 9, Ohio, U. S. A.



LITTLEFORD MACHINE BASES...

*Accuracy
in
Design*

*fabricated
to your
specifications*

Let Littleford show you how
precision fabrication can be had
at low cost. Send Blueprints for
estimate.

FABRICATORS OF PLATE AND SHEET METALS

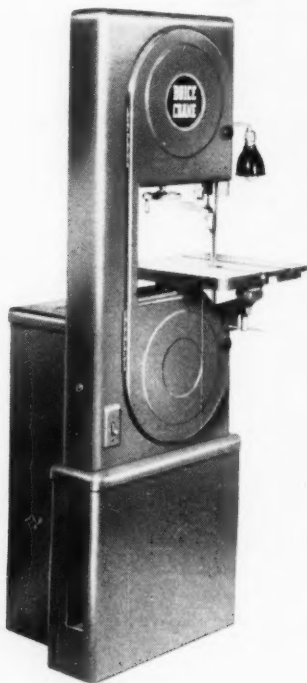


LITTLEFORD

LITTLEFORD BROS. INC.
433 E. Pearl St., Cincinnati 2, Ohio

for blade and band file installation and removal. The lower wheel operates in a sealed compartment which opens into chute for easy collection and disposal of dust, cuttings, and filings.

Specially designed guides are said to assure efficient operation using blades $\frac{3}{8}$ and $\frac{3}{4}$ inch wide. File bands are available in two widths, two shapes, and six cuts.



Boice-Crane Combination Contour Saw
and Band Filer

The file segments have self-aligning ends which automatically link to produce a continuous, rigid, flat surface that is said to be equal to a one-piece file or broach.

Improved Cemented Carbide

Higher hardness, increased wear resistance, greater cutting edge strength and cratering resistance, and more rapid dissipation of heat at the cutting edge are advantages which are claimed to be provided for by an improved No. 905 grade

DANT

RIVETERS



• Pioneers in the riveting field. Head rivets from smallest to $\frac{3}{4}$ " diameter, either by noiseless spinning or vibrating hammer method.—Sizes to meet all needs.—Types include Vertical and Horizontal Multiple Spindles. Write for literature—and don't forget to send samples.

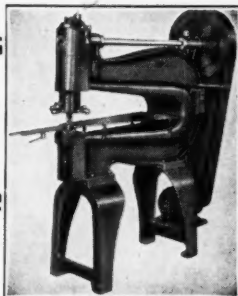
THE GRANT MFG. & MACHINE CO.
96 Silliman Ave. Bridgeport 5, Conn.

SAVAGE

**NIBBLING
MACHINE**

**NIBBLE
YOUR COSTS**

Ask for
Free Bulletin "H"



Capacity $\frac{3}{4}$ "
mild steel

FOR TUBE SLOTTING, TUBE SHAPING
AND CUTTING FLAT SHEETS BY TEM-
PLATE OR TO A SCRIBED LINE.

Manufactured by

W. J. SAVAGE COMPANY

Knoxville

Since 1885

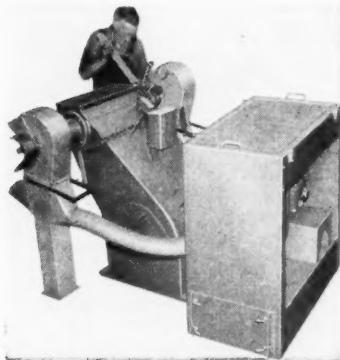
Tennessee

Pioneer Mfrs. of Nibbling Machines

STOPS DUSTS with DUSTKOPS

Low Cost, Efficient, Compact. For recirculating cleaned air or for outside exhaust (toxic or objectionable fumes). Twelve models (314 to 3600 cfm), to collect dust from: grinding, buffing, polishing, sanding, wire brushing, bagging, blast cleaning, trimming, woodworking, etc.

**Model 1150—1400 cfm—always
the best choice for Hammond
VRO Polisher.**



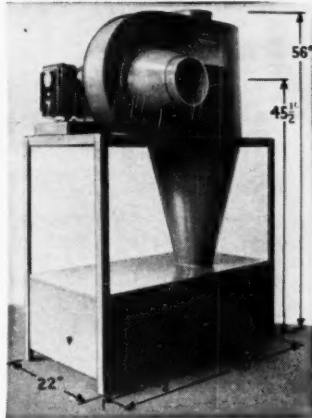
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tion by return
mail, describe
dust problem.
No obligation.

**New Catalog
605 now
ready.**

**AGET-
DETROIT
CO.**

207 Main at
Washington St.
ANN ARBOR,
MICHIGAN

**Model 20N30—2300 cfm—
exhausts cleaned air outdoors.**



of cemented carbide announced by the Carboly Co., Inc., 11143 E. Eight Mile Blvd., Detroit 32, Mich. Intended for finishing and light roughing cuts on non-ferrous metals and cast irons with hardness up to Brinell 550, the improved carbide is also said to be fully as easy to braze and grind as the previous No. 905 grade.

The Carboly Improved No. 905 Cemented Carbide can be obtained in many sizes and types of standard tools and blanks for use in performing boring, grooving, facing, turning, and other operations.

Severance CHATTERLESS TOOLS



Winning their way on job after job, they are carefully designed to preclude chatter and can be depended on to produce superior finishes.

Severance CHATTERLESS COUNTERSINKS

STANDARD TYPE —

Stocked in 13 diameters up to 2" and in 30°, 41°, 45°, and 60° angles (with C/L).

Sizes 1" and larger stocked also threaded for shanks — tapered or straight — in various sizes.

Use CARBIDE for tough jobs or high production.

HEAVY DUTY TYPE —
Features larger shanks having a long drive.

Full range of sizes and angles.



HEADQUARTERS FOR COUNTERSINKS, REAMERS, SEATING TOOLS, and SPOTFACERS that preclude chatter.

Severance CHATTERLESS BALL SEAT REAMERS



Standard and Heavy Duty Types 8 sizes each. Made also for shaped cavities — as ordered.

BALL NOSE DRILLS —
In corresponding sizes hog out the stock for Ball Seat Reamers.



Severance TAPER REAMERS



- Faster cutting
- Better finishing
- Shear-cut teeth

Tapers up to 15° quickly supplied from stock — up to 1 1/4" diameter x 2 3/4" long.

Unexcelled for holes having keyways, ports, splines, cross holes, etc.

Write for Catalog 16

SEVERANCE TOOL INDUSTRIES, INC.

724 Iowa Street

Saginaw, Mich.

Die Checker

Known as the "Pant-O-Scriber" Die Checker, a device which is designed to provide a fast, accurate, and economical visual method of gaging the contour profiles, flash, and striking surfaces of forging dies and punches has been developed by the Engineers Specialties Division, The Universal Engraving & Colorplate Co., Inc., 980 Ellicott St., Buffalo 8, New York.

According to the manufacturer, the unit affords fast semi-automatic operation; provides a permanent inspection record of die sets; permits a periodic

quality control check for die wear; is designed to check master die set, or wear, in relation to a master chart; is designed to check duplicate die set, or wear, in relation to a master die; permits the checking of shrinkage between die and forged part; permits visual inspection, with the operator viewing simultaneously the entire cavity, flash, or gutter profiles and striking surfaces of any desired cross section of dies and punches; and enables finishing operations to be performed on or modifications to be made to dies without removal from the die checker.

Said to require less than 60 seconds per section in checking dies or punches, the Pant-O-Scriber can be efficiently employed by unskilled operators and is so constructed that the entire gaging column can be quickly moved to one side when loading dies or when making modifications on dies. The Model 400 die

HIGH SPEED CARBIDE

MIDGET MILL GROUP



DEBURRING GROUP



TUBING GROUP





MARKING DEVICES

TYPE HOLDERS AND TYPE . . . ROLL MARKERS
HAND STAMPS . . . LOGOTYPES . . . DIES . . . STANDARD
AND SPECIAL STAMPS . . . INSPECTORS' STAMPS . . .
MACHINE ENGRAVING . . . PRECISION DUPLICATING

NEW METHOD STEEL STAMPS, Inc.
149 Joseph Campau, Detroit 7, U.S.A.

BAUMBACH

**THE FIRST IN
DIE SETS**



Being originators of Standard Die Sets naturally we are steps ahead in Design—Precision—Dependability and Economy. Baumbach Die Sets can be disassembled. The Leader Pins and Bushings can be used on other size Die Sets—reducing inventorying a lot of Die Sets. Costly machining time is also reduced. Learn all about Baumbach advantages before you buy. Write for circular.

E. A. BAUMBACH MFG. CO.
1806 S. Kilbourn Ave. • Chicago 23, Ill.

WHICH FREE CARTON OF SAMPLES CAN YOU USE?



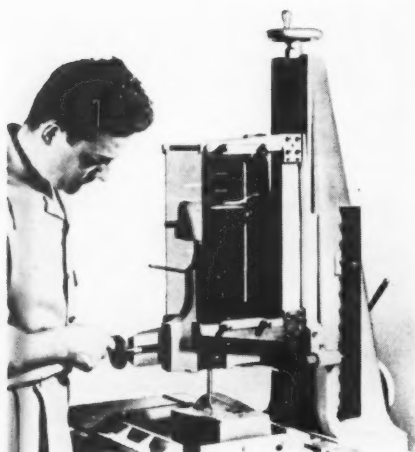
Selected coarse and fine grit abrasive compounds suited for general shop use—machinery repairs and maintenance, tool rooms.

Selected fine grit compounds for precision lapping only—closely fitted parts, pressure holding surfaces, gauges, tools, seals, molds and dies.

WRITE FOR
One OR THE *Other*
6 LIBERAL JARS
DIFFERENT GRADES
Absolutely **FREE**

Anyone working in metals can profitably use one or the other of these kits. We'll mail free, postage paid, anywhere in the United States as a get-acquainted gesture. Write today—no obligation or sales solicitation will follow. Please specify carton desired.

UNITED STATES PRODUCTS CO. 518 MELWOOD ST. PITTSBURGH, PA.



Operator Tracing Contour Profile of Section of Die Using "Pant-O-Scriber" Model 400 Die Checker

checker shown herewith is designed for checking die sets for turbine and jet engine blades and is said to accommodate

die blocks weighing up to 800 lb. and in sizes up to 22 inches long x 14 inches wide x 12 inches thick. Similar units can be supplied for the inspection of larger dies, cams, camshafts, propellers, and profiles of other parts.

Single and Double Crank Presses

Said to conform to the recently established standards of the Joint Industry Conference, a series of straight side single and double-crank presses developed by the E. W. Bliss Co., Toledo 7, Ohio, can be used for such metal-working operations as blanking, cutting, punching, shaping, stamping, embossing, and, when equipped with Bliss-Marquette die cushions, for a considerable range of drawing and forming work.

Features of the presses include rugged box-type crowns and slides reinforced by deep internal ribs, and barrel-type slide adjustments which allow for the accommodation of dies varying greatly in height. All press frames are of four-piece tie-rod construction and are made of high grade Meehanite castings. Slides and gibs are of long design for the precision grinding of dies into the work. The slides are said to remain completely with-

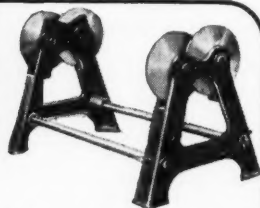
SELECT THE BEST ... Balancing Tool for Your Work from Sundstrand's Complete Line

Here's a complete line of Balancing Tools which will save their cost quickly on balancing or truing operations. Accurately sensitive and durable, they provide a simple, reliable means for checking the balance of parts like gears, shafts, fly wheels, pulleys, etc. The standard sizes available are shown in capacity chart at right.



FREE ADDITIONAL DATA

You can obtain complete information on Sundstrand Balancing Tools by writing for bulletin No. 590.



CAPACITIES

| Swing | Between Standards | Weight Capacity |
|--------|-------------------|-----------------|
| 21 in. | 20 in. | 12 lbs. |
| 21 in. | 20 in. | 800 lbs. |
| 43 in. | 29 in. | 800 lbs. |
| 43 in. | 29 in. | 2,000 lbs. |
| 6 ft. | 5 ft. | 5,000 lbs. |
| 8 ft. | 8 ft. | 10,000 lbs. |
| Any | Any | 24,000 lbs. |
| 43 in. | 30 in. | 800 lbs. |

SUNDSTRAND
MACHINE TOOL COMPANY
2539 Eleventh St. Rockford, Ill., U.S.A.

in the gibs at any position of stroke or adjustment. Power adjustment of the slide is standard equipment on all presses.

Single end drive presses with capacities up to and including 250 tons each have a new type of pneumatic friction clutch mounted on the crankshaft. All gears and other drive parts rotate continuously. As a result, the only load on the clutch and brake during engagement and disengagement is that required to start and stop the counterbalanced slide and crank-



Bliss 250-Ton Double-Crank Press

shaft, thus minimizing heat and wear and providing for long clutch life. An electric control system is an additional standard feature of each press.

Floor Patching Material

The Flexrock Co., 3615 Filbert St., Philadelphia 4, Pa., has announced that its "Instant-Use" Floor Patching Material for keeping concrete, composition, and brick floors free of ruts and cracks is now as easy to handle and apply as it has always been quickly ready to use. Plasticizer has been added, without changing the strength and toughness of the product, to render the material easier to scoop from containers and to facilitate spreading, leveling, and tamping.

MARK and DEMAGNETIZE IN ONE OPERATION



The Luma combination etchtool and demagnetizer, etches, demagnetizes, anneals and solders. Permanently marks hardest steel with ease of a pencil. Write for complete information.

Luma Electric Equipment Co.
P. O. BOX 132-M5 TOLEDO 1, OHIO



Hammond NO-DUST GRINDER

- Requires only 6 1/2 square feet.
 - Protects employees' health — and nearby machine tools from dust and grit.
- For 10", 12" and 14" wheels.

WRITE FOR CATALOG

Hammond Machinery Builders
1615 DOUGLAS AVE., KALAMAZOO, MICH.

Precision Aligning Level

The Bullard Co., Bridgeport 2, Conn., is now manufacturing, under the Bullard-Universal trade name, a precision aligning level which is available in two sizes (18 and 27 inches) for leveling all types of machines. The vial used is made of high quality optical glass, specially ground, and is mounted on two brass studs which permit adjustments in the same manner as with the level vials used in surveying instruments. The bubble in the vial is said to have a guaranteed sensitiveness of 5 seconds of arc per graduation which is equivalent to showing per graduation on the vial a variation of



Bullard-Universal Precision Aligning Level

0.0003 inch per foot.

The level casting is carefully seasoned, machined, and scraped and is thoroughly insulated from the palm of the hand by means of a handle of special non-conductive material. The level is supplied packed in a felt lined box for maximum protection.

STURDY, CONVENIENT, LOW-COST JIFFY ALL METAL CABINETS



FOR
SMALL
PARTS,
DRILLS,
TOOLS,
CARBIDE
TIPS
AND
MOUNTED
POINTS

**32 DRAWER
UNIT •
DIVIDES INTO 96
COMPARTMENTS
\$8.95**

POSTAGE PAID

**64 DRAWER
UNIT •
DIVIDES INTO 192
COMPARTMENTS
\$15.95**

Rustproof Aluminum Drawers

APPROXIMATE SIZES

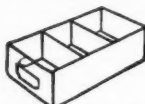
DRAWER
1 1/4" Deep
2 3/4" Wide
6" Long

32 DRAWER UNIT
6" Deep
12 3/4" Wide
15 1/4" High

64 DRAWER UNIT
6" Deep
25 1/2" Wide
15 1/4" High

Complete set of
Dividers and Index
Cards supplied.

Spot welded steel cabinet, metal flange drawer guides, enamel finish and solid one-piece aluminum drawers in natural satin finish. The first multiple drawer metal cabinet for convenient storage of small parts, drills, tools, carbide tips, mounted points or assembly bench work at such a low cost. Order now for immediate delivery. Send check or money order or rated companies shipped on receipt of purchase order.

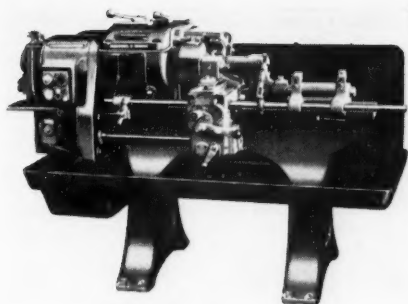


KAYTEE PRODUCTS
DEPT. 15 - BOX 588 - CANTON, OHIO

Pipe Nipple Machine

A roller cutter type pipe nipple machine which is said to be capable of chamfering both ends of pipe nipples for threading and cutting off at a production rate of 100 or more nipples per minute has been developed by Bardons & Oliver, Inc., 1113 W. 9th St., Cleveland 13, Ohio. The machine includes an anti-friction bearing, all geared, alloy steel headstock which provides six quick speed changes from 560 to 2,280 r.p.m. for efficiently handling all sizes of nipples from 3/8 to 1 1/2 inches without pick-off gears.

The roller cutter slide and chamfering slide of the machine are cam driven from an apron gearbox featuring three quick feed changes obtainable through sliding gears. One chamfering slide cam and two cutoff



Bardons & Oliver Roller Cutter Type Pipe Nipple Machine

slide cams are said to be normally sufficient to efficiently produce all sizes of nipples from $\frac{3}{8}$ to $1\frac{1}{2}$ inches. The tool-slide has replaceable hardened and ground alloy steel ways.

A patented roller pipe feed permits the automatic cutting and chamfering of all lengths from $\frac{1}{4}$ to 12 inches. Longer lengths may also be produced by operating the machine semi-automatically. Changes in setup from one size of nipple

to another can be quickly effected with the machine, which is designed to allow for the use of a conventional cutoff tool-holder in place of the roller cutter holder if and when it is desired to cut light or heavy wall tubing or solid bars of ferrous or non-ferrous metals.

Vertical Hydraulic Lathe

The special heavy-duty vertical lathe shown herewith has been built by Snyder Tool & Engineering Co., 3400 E. Lafayette Ave., Detroit 7, Mich., for one of the large manufacturers of car and truck components in order to develop maximum efficiency from the use of carbide tooling. Although designed for a specific application, it is widely adaptable to facing, boring, or turning a variety of large workpieces simply by changing the fixtures and tool-holders.

The vertical, welded steel column carries a hydraulically operated, horizontal cross slide upon which are mounted two hydraulically operated vertical toolslides. Each toolslide is provided with T-slots and keyways for mounting tool blocks and holders. All slides and ways are hardened and ground.

A Check List for Your Needs

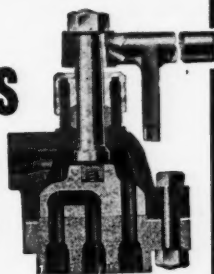
NICHOLSON AIR AND HYDRAULIC VALVES

Are in Use for Controlling These Types of Equipment:

| | |
|-------------------------|----------------------|
| Plastic Molding Presses | Watch Case Heaters |
| Sterilizers | Vulcanizing Machines |
| Presses . Hoists | Rimming Machines |
| Cranes . Elevators | Saw Cut-Offs |
| Gates . Dumps | Open Hearth Furnaces |
| Brakes . Clutches | Mud Guns |
| Bus Doors | Bell Valves |
| Locomotives | Molding Machines |
| Larry Cars | Die Machines |
| Road Machinery | Ore Tables |
| Large Gate Valves | Automobile Lifts |
| Banbury Mixers | Special Applications |



size $\frac{1}{4}$ " to $2\frac{1}{2}$ "; press. to 5,000 lbs. CATALOG 546.



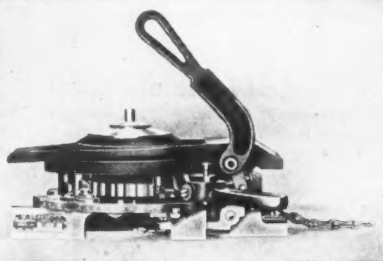
Nicholson valves in lever, foot, solenoid, motor types for air, gas, oil, steam, water;

W. H. NICHOLSON & CO.

136 Oregon St., Wilkes-Barre, Pa.

Steam & Air Traps . Control Valves . Expan. Mandrels . Arbor Presses . Welded Floats

AUTOMATIC CHUCKING AND INDEXING FIXTURE



- 1.—1800 light cuts per hour.
 - 2.—Either horizontal or vertical position.
 - 3.—Collets changed instantly.
 - 4.—Automatically knocks piece out.
- Model D—Ratchet indexing only—1" cap.
Model E—Both degree and ratchet indexing
—Capacity up to 1"
Model F—Both degree and ratchet indexing
—Capacity up to 2 1/4"

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J. W. DEARBORN • Ansonia, Conn.

SAWING

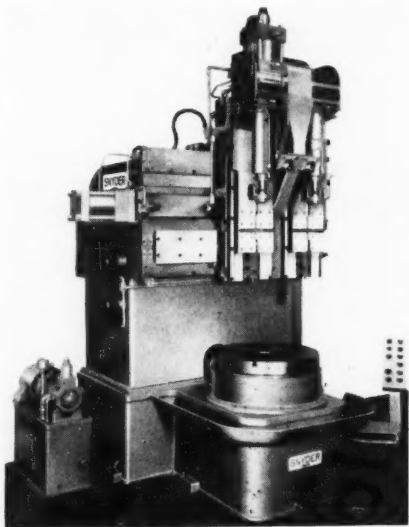
MILLING

GROB

BROTHERS

GRAFTON WISCONSIN

The horizontal slide has a 21-inch stroke and the vertical slides each have a 14-inch stroke. However, horizontal slides up to 27-inch stroke and vertical slides up to 20-inch stroke can be employed if desired. A 30-inch variable speed rotating table mounted on the base is provided with T-slots and a pilot for mounting fixtures or chucks. The table is mounted in preloaded Timken bearings and is driven through spiral, bevel, and helical gears. Power is supplied by a 15 h.p. motor. The drive is



Snyder Special Heavy Duty Vertical
Hydraulic Lathe

rheostat controlled, and speeds from 46.5 to 185 r.p.m. are available.

The machine can be set for various combinations of automatic cycling. The base is of welded steel, heavily reinforced and thoroughly normalized, and houses a large chip and coolant tank. The required floor space is 70 x 100 inches.

Plug Valve Lubricant

For the automatic lubrication of plug valves, the Nordstrom Valve Division, Rockwell Mfg. Co., Pittsburgh 8, Pa., is marketing an energizable lubricant known as "Hypermatic." The lubricant is said to keep valves fully lubricated over long periods of use. The pressure

exerted in injecting the lubricant into the valve powers the lubricant. The stored energy is released later when needed to feed the lubricant into any voids that might occur within the pressurized ducts of the valve system.

Said to be both compressible and expandable and to embody dynamic properties that cause it to feed as needed, Hypermatic Lubricant can be injected into a valve either by turning down a lubricant screw or by the use of a grease gun. The lubricant, which will successfully operate in pressurized plug valves of all sizes, will actuate with a pressure in the lubricant system as low as 50 lb., while in very high pressure service the lubricant pressure can be built up to 1,000 lb. and higher. Hypermatic is claimed to be effective in temperature ranges from subzero to 250 deg. Fahrenheit.

Induction Heating Unit

Designated as the Type LI-25, an induction heating unit announced by the High Frequency Division, Lindberg Engineering Co., 2469 W. Hubbard St., Chicago 12, Ill., is said to have a conservatively rated output of 25 kilowatts at 100 per cent duty cycle with a normal frequency of 450,000 cycles per second. The unit is available for operation on 230, 460, and 550 volts, 3-phase 60-cycle power. A manually operated tap switch enables the operator to compensate for line voltage changes.

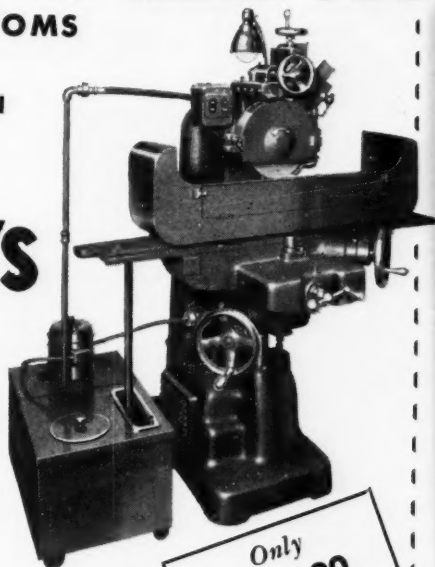
Recently developed industrial tubes are used throughout, with all filament voltages automatically controlled by voltage regulating transformers. To prevent harmful condensation, the unit is equipped with a closed system which circulates temperature controlled distilled water through water-cooled components. Minimum water consumption, low water pressure requirements, and safe operation with hard water are additional ad-

DOING A REAL JOB IN TOOL-ROOMS

AND ON
PRODUCTION
LINES

COVEL'S

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15



Only
\$965.00

F.O.B.
includes
all electric

Covell's No. 15 hand-feed surface grinder has been a must in shops all over the world. Its ability to work equally well in Tool-Room or on Production Line has made it especially useful to the smaller shop. Quick set-ups save valuable time on short-run jobs. 10" grinding wheel and 3-speed spindle are standard equipment. All controls are within easy reach of operator whether standing or sitting. Wet attachment and built-in wheel dresser available as extras.

Send for free illustrated Bulletin MM-119 and name of nearest dealer.

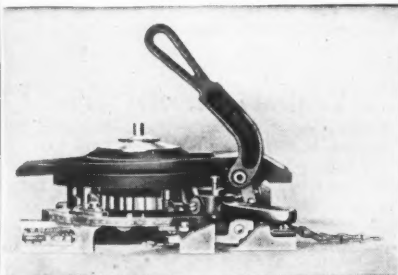
OUR 75TH YEAR

COVEL

INDUSTRIAL GRINDERS

MFG. COMPANY
BENTON HARBOR, MICHIGAN

AUTOMATIC CHUCKING AND INDEXING FIXTURE



- 1.—1800 light cuts per hour.
 - 2.—Either horizontal or vertical position.
 - 3.—Collets changed instantly.
 - 4.—Automatically knocks piece out.
- Model D—Ratchet indexing only—1" cap.
Model E—Both degree and ratchet indexing
—Capacity up to 1"
Model F—Both degree and ratchet indexing
—Capacity up to 2 1/4"

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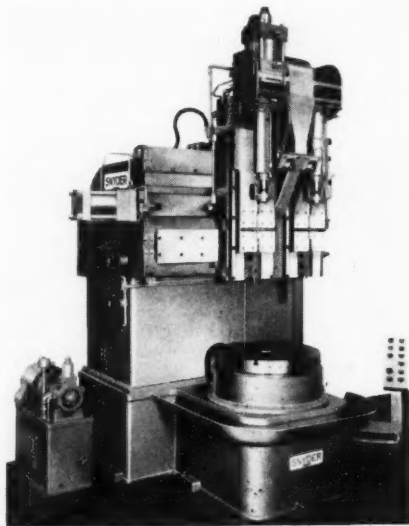
J. W. DEARBORN • Ansonia, Conn.

SAWING MILLING

GROB BROTHERS

GRAFTON WISCONSIN

The horizontal slide has a 21-inch stroke and the vertical slides each have a 14-inch stroke. However, horizontal slides up to 27-inch stroke and vertical slides up to 20-inch stroke can be employed if desired. A 30-inch variable speed rotating table mounted on the base is provided with T-slots and a pilot for mounting fixtures or chucks. The table is mounted in preloaded Timken bearings and is driven through spiral, bevel, and helical gears. Power is supplied by a 15 h.p. motor. The drive is



Snyder Special Heavy Duty Vertical
Hydraulic Lathe

rheostat controlled, and speeds from 46.5 to 185 r.p.m. are available.

The machine can be set for various combinations of automatic cycling. The base is of welded steel, heavily reinforced and thoroughly normalized, and houses a large chip and coolant tank. The required floor space is 70 x 100 inches.

Plug Valve Lubricant

For the automatic lubrication of plug valves, the Nordstrom Valve Division, Rockwell Mfg. Co., Pittsburgh 8, Pa., is marketing an energizable lubricant known as "Hypermatic." The lubricant is said to keep valves fully lubricated over long periods of use. The pressure

exerted in injecting the lubricant into the valve powers the lubricant. The stored energy is released later when needed to feed the lubricant into any voids that might occur within the pressurized ducts of the valve system.

Said to be both compressible and expandable and to embody dynamic properties that cause it to feed as needed, Hypermatic Lubricant can be injected into a valve either by turning down a lubricant screw or by the use of a grease gun. The lubricant, which will successfully operate in pressurized plug valves of all sizes, will actuate with a pressure in the lubricant system as low as 50 lb., while in very high pressure service the lubricant pressure can be built up to 1,000 lb. and higher. Hypermatic is claimed to be effective in temperature ranges from subzero to 250 deg. Fahrenheit.

Induction Heating Unit

Designated as the Type LI-25, an induction heating unit announced by the High Frequency Division, Lindberg Engineering Co., 2469 W. Hubbard St., Chicago 12, Ill., is said to have a conservatively rated output of 25 kilowatts at 100 per cent duty cycle with a normal frequency of 450,000 cycles per second. The unit is available for operation on 230, 460, and 550 volts, 3-phase 60-cycle power. A manually operated tap switch enables the operator to compensate for line voltage changes.

Recently developed industrial tubes are used throughout, with all filament voltages automatically controlled by voltage regulating transformers. To prevent harmful condensation, the unit is equipped with a closed system which circulates temperature controlled distilled water through water-cooled components. Minimum water consumption, low water pressure requirements, and safe operation with hard water are additional ad-

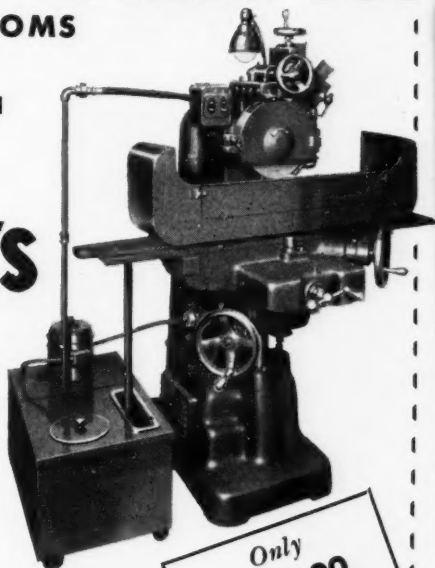
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Covell's No. 15 hand-feed surface grinder has been a must in shops all over the world. Its ability to work equally well in Tool-Room or on Production Line has made it especially useful to the small shop. Quick set-ups save valuable time on short-run jobs. 10" grinding wheel and 3-speed spindle are standard equipment. All controls are within easy reach of operator whether standing or sitting. Wet attachment and built-in wheel dresser available as extras.

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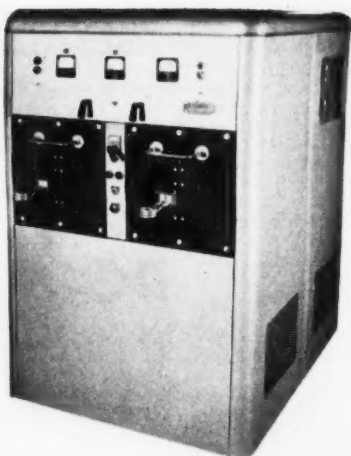
BENTON HARBOR,

MICHIGAN

vantages which are said to be provided by the system.

Servicing of the Type LI-25 is claimed to be simplified by a unique system of indicating lamps which instantaneously reveals abnormal conditions at any one of the protective devices. All electrical overload mechanisms can be reset by the flick of a switch on the front operating panel. Work coils are protected from burnout by an interlocked solenoid valve which controls work coil cooling water.

Standard equipment of the unit includes a synchronous timer with vernier heat cycle adjustment and additional circuits



Lindberg Type LI-25 Induction Heating Unit

to control two other operations, such as quench, fixture movement, and so on. The Type LI-25 is available with one or two working stations, each complete with both high and low impedance terminals.



DRILL and PILOT BUSHINGS Frictionless —Rotary

For core drilling, T. C. and high speed boring, turret tool, piloting, etc. Won't stick or clog. Dust proof as a watch. Write for details.

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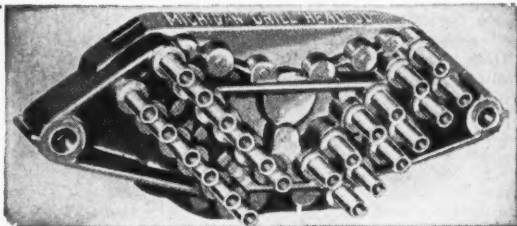
Double Piloted Valve

As an addition to its "Quick-As-Wink" line of valves, C. B. Hunt & Son, Inc., Salem, Ohio, has introduced a double piloted single plunger valve featuring sturdy construction, ease of operation, and carefully balanced parts. The pilot cylinder can be operated at pressures as low as 25 p.s.i., thus permitting the use of the valve at most instrument air pressures and making it well suited for use in safety control arrangements on

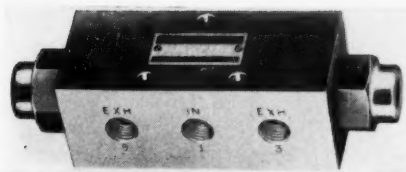
Pictured: a 24-Spindle Heavy-Duty Drill Head.

DESIGNERS AND MANUFACTURERS OF MULTIPLE DRILLING EQUIPMENT.

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MICHIGAN DRILL HEAD CO. 971 E. 8-Mile Road, Hazel Park, Mich.



Hunt "Quick-As-Wink" Double Piloted Valve

presses, shears, cutters, and so on; for air clutches; and for sequence operating cycles.

The valve consists of an aluminum housing, a hollow stainless steel plunger with precision placed ports, and stainless steel pilot pistons mounted in brass pilot cylinders. According to the manufacturer, the valve can be completely disassembled and reassembled in a few minutes without disturbing the main piping. The valve is furnished tapped for either $\frac{1}{8}$ or $\frac{1}{4}$ -inch pipe connection in 2-way, 3-way, double 2-way, 4-way, and 5-way designs for use with air, oil, or water at line pressures up to 125 p.s.i. maximum (also vacuum) and at normal temperatures (not exceeding 150 deg. F.).

Overhead Threading Attachment

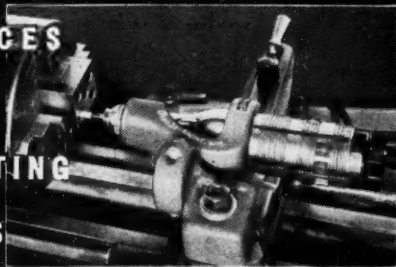
An overhead threading attachment which is said to speed single-point chasing operations in non-ferrous metals is now available for Warner & Swasey uni-

versal turret lathes, according to an announcement made by The Warner & Swasey Co., Cleveland 3, Ohio. The attachment is intended for mounting at the rear of the turret lathe headstock and extends a screw-adjustment slide tool-holder to the right of the spindle. A fixed overhead bar supports a counterweighted chasing bar on which a guide arm and the chasing tool arm are located.

When the chasing tool arm is lowered, a follower at the headstock end of the chasing bar engages a leader driven by gears from the spindle to move the bar and attached tool longitudinally in accordance with the pitch of the leader-

45,000 R.P.M.

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New all-metal housing . . . new, stronger precision quill . . . new sealed micro-precision bearings that never need lubrication. *The ideal speed, power and precision for tungsten carbide micro-mills.* Use with or without Super COOL-FLEX Attachment or mount in lathe, drill press, milling machine, etc. Grinds, mills, drills, finishes and polishes all materials including the hardest steel. Up to $\frac{1}{4}$ H.P., 115-volt AC-DC motor is protected by replaceable fusetrone. Tools and attachments are available for almost any production set-up.

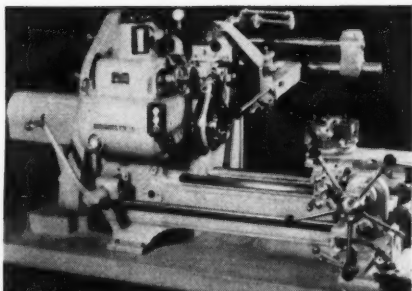


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1345 Clark St. • Racine, Wis.

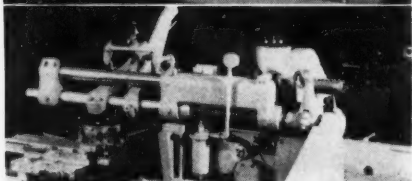
PRECISE SUPER 40

follower combination chosen. An adjustable bracket fixed to the head of the machine provides a slide on which the guide arm rests for positive guiding of the chasing tool. The slide may be tilted so that a pipe thread can be cut. The chasing tool arm can be located anywhere along the chasing bar, and the threading length which can be cut at one time is $4\frac{1}{4}$ inches.

At the end of the desired threaded length, the operator swings the chasing arm up, lifting the tool from the work, the chasing bar counterweight keeping the arm in a raised position. A compression spring returns the chasing bar longi-



Warner & Swasey Overhead Threading Attachment for Turret Lathes



tudinally to its original position for the next cut or the next piece. To further speed the cycle, a brake is also furnished to be attached to the headstock with a belt loop which surrounds the chuck.

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**LAY-OUT AND
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13 COLORS

For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheet, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for trial sample and circular.

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Metal-Cutting Band Saw

Designated as the No. 610-S, a portable metal-cutting band saw announced by the Machine Tool Division, Kalamazoo Tank & Silo Co., Kalamazoo 16, Mich., is said to cut angles, bars, tubes, and pipe with equal ease and accuracy (up to a capacity of 6 x 10 inches). Features of the machine include four cutting speeds (from 53 to 266 f.p.m.); unique hydraulic dashpot mechanism to ensure controlled,

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**PATENTED CUTTING OFF TOOL HOLDERS
PATENTED CUTTING OFF BLADES**

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

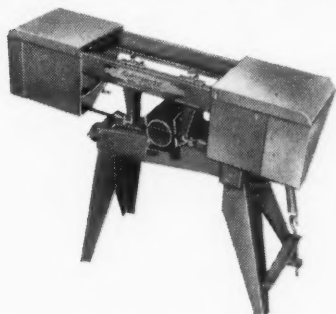
Manufactured by

J. MILTON LUERS, 12 Pine Street, Mt. Clemens, Mich.

Produced under License Issued by John Milton Luers Patents Inc.

constant pressure from beginning to end of cut; blade mounting from top (for half-minute blade changes); unobstruct-

edly built to maintain accuracy and weighs 198 lb. with motor for ready portability.



Kalamazoo No. 610-S Metal-Cutting Band Saw

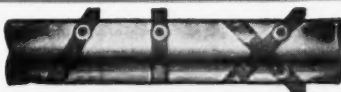
ed view of cutting operation; and double sets of blade cleaning brushes.

The machine stand has four legs for maximum stability. The motor mounting is designed to accommodate any standard motor ($\frac{1}{2}$ h.p. 110/60/1). The saw is rug-

Locknut

A locknut consisting of a standard steel nut and a slightly elliptical retainer ring combined in a single unit is now being manufactured by the Security Locknut Corp., 1815 N. Long Ave., Chicago 39, Ill. When the locknut is applied, the bolt forces the heat-treated alloy steel retainer ring back into circular shape, thereby causing the retainer to grip the bolt threads with high pressure and preventing rotation of the nut even under conditions of severe vibration, it is claimed. The position of the nut on the threaded portion of the bolt or other threaded part can be readjusted at any time, and the nut may be removed and reapplied over and over again without losing its locking power and without injury to the threads of the bolt, the manufacturer states.

The locknut, which can be applied in either direction, is made with National standard sizes ranging from $\frac{3}{8}$ to $2\frac{1}{2}$ inches.



A BETTER BORING BAR

OUR fine list of Customers is PROOF that our method of broaching square holes makes a better fit for the tool bit. This means more rigidity and longer life especially with tungsten Carbide. We also make bars for our Type B and Type C cutters or a combination of tool bits and cutters. Bars are made to suit customers' requirements as to method of drive, pilot, number of holes, angle of bit, etc. Our two-bladed cutters can be floated in the bar or held rigidly. Cutters are interchangeable—hence can be ground in an arbor in the tool room and only require a few seconds for inserting in the bar.

Square hole sizes range from $\frac{1}{2}$ " up to and including $\frac{3}{4}$ ".

THE DETROIT BORING BAR CO.
688 E. FORT ST. Detroit 26, Mich.

Established



1927

TYPE "B" AND "C" CUTTERS

Suitable for Tipping With Tungsten Carbide



"B" A strong rigid serrated 2-bladed cutter—located in the bar with a taper pin. Bore holes accurately to close limits. Can be expanded and reground giving long life. Sizes $\frac{7}{8}$ " dia. up to 6".



"C" A simple 2-bladed reaming cutter. Can be expanded and reground. Located in the bar by a hardened V. This V never has to be reground as blades are expanded.



Fits other bars with slots
 $\frac{3}{8}$ " x $\frac{1}{2}$ "
 $\frac{1}{2}$ " x 1"
 $\frac{5}{8}$ " x $1\frac{1}{2}$ "
 $\frac{3}{4}$ " x $1\frac{1}{2}$ "



Engraved Dies and Stamp

The accompanying illustration shows two types of engraved dies and an engraved stamp now being offered by The Acromark Co., 9 Morrell St., Elizabeth 4, N. J. Intended for use in a standard heavy punch press or hydraulic press, the die shown at the left in the illustration is a coining die from which watch dials, fine instrument dials, and fine design trade marks and emblems may be coined from stainless steel, gold, silver, brass, or copper. The lettering or design is delicately engraved to produce a raised or sunken coining result, or it may be engraved to provide both a raised and sunken design



Acromark Engraved Dies and Stamp

in combination. A vent or relief channel is provided at one side of the design to allow for the flow of metal.

The "gooseneck" stamp shown in the center of the illustration includes fine raised letter engraving on the impression face, curved to mark the inside of a bushing, collar, or ring. This stamp is for use with a hammer.

The shank style design and lettering die shown at the right in the illustration can be made to include such fine engraving as an intricate trade mark design and a company name, and is intended for use in a foot press or a small punch press.

KESTER FLUX

62 Types Available

THE PROPER FLUX
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Salts and paste
available in 1, 5,
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containers.

Using the proper flux for the job will greatly increase soldering efficiency. Contact Kester's Technical Department on any flux problem. There is no obligation.

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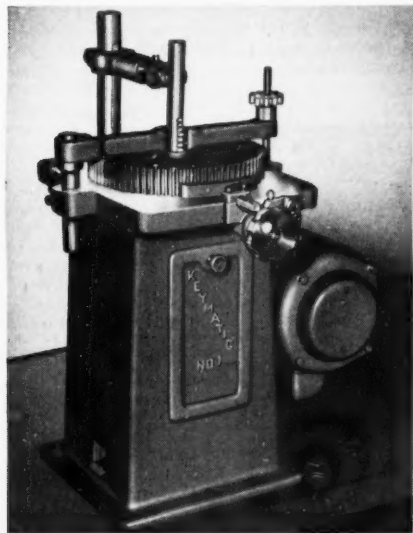
KESTER
SOLDER

Keyseating Machine

For cutting keyways $\frac{1}{8}$ to $\frac{1}{2}$ inch in cast iron and $\frac{1}{8}$ to $\frac{3}{8}$ inch in steel, the Keymatic Machine Co., P. O. Box 1953, Cincinnati 1, Ohio, is manufacturing the Keymatic No. 1 Keyseating Machine shown here-with, which incorporates a smooth metal removing multiple tooth type cutter that is locked in a bar of

ample proportions which, in turn, takes the brunt of the thrust of the cut.

Designed for easy operation, the machine is said to require no bushing for each size of hole or cutter. The work, firmly fastened to the table of the machine, actually feeds into the cutter bar. The change from one size of work to another requires only the changing of the cutter bar, this operation being accom-



Keymatic No. 1 Keyseating Machine

plished by loosening and tightening one hollow head screw.

Centering of the work on the table is effected automatically. Work size is said to be unlimited since the machine is designed to accommodate spoke type work up to any practical diameter. Automatic relief on the upstroke of the cutter is said to result in long cutter life. The simple construction of the machine is claimed to afford quick adjustment at all times as the entire mechanism is easily accessible. The feed to depth is automatic, with automatic stop. The operator can quickly set the feed for any depth desired.

Three-Way Air Valve

A three-way air valve of the "on" or normally open type is being offered in two models, designated as the FT-102 and

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STEEL
and
CARBIDES**



THE
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WAY

Original Electric Etcher. Thousands in Daily Use

Mark hardened parts, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly. • Three sizes to meet all requirements.

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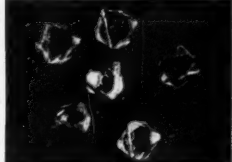
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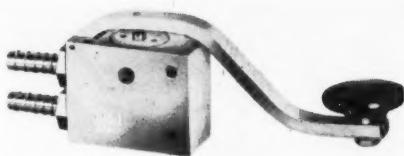
CLIPPER DIAMOND TOOL CO., INC.

21-C W. 46 ST. N.Y. 19



FC-102, by the Mead Specialties Co., Dept. V-42, 4114 N. Knox Ave., Chicago 41, Ill. The Model FT-102 has $\frac{3}{8}$ -inch pipe thread apertures or quick response when used with air cylinders up to 6-inch bore, and is operated by very light pressure on the handle-lever button. The Model FC-102 is the same as the Model FT-102 without the lever, for operation by means of a suitably located cam or trigger on the working machine.

Both models of the valve have mounting holes at the top and sides to facilitate attachment to machines, and are of the poppet type so as to reduce wear to a

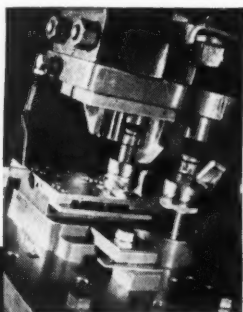
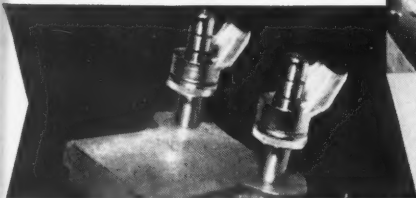


Mead Model FT-102 Three-Way Air Valve

minimum. Hose nipples to accommodate $\frac{3}{8}$ -inch i.d. and up to $\frac{3}{4}$ -inch o.d. air hose are included.

NOW!

Positive Lubrication for Leader Pins and Bushings



Acro leader pin oilers shown in position on press in illustration above. Left close-up of Acro leader pins attached to die shoe.

Eliminate Wear and Maintain Accuracy In Dies with ACRO Pin Oilers

Put these oilers on all your presses and forget lubrication troubles. Regardless of press speed, Acro Pin Oilers provide a constant cushion of oil between pin and bushing. Oil is transmitted to pins by capillary attraction on each upward stroke of press. Hand oiling is eliminated, die life prolonged, production increased.

Acro Pin Oilers slip over leader pins, are easily adjusted to proper height and tightened. After filling, no other adjustment is necessary, except refilling. Especially adaptable for Hi-speed long runs. A reservoir of oil for long time constant "every-stroke-lubrication" will definitely provide maximum pin and bushing accuracy that will result in longer die life, avoid costly repairs and loss of production.

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Get the complete details on this new fool-proof method of leader pin lubrication. Write for bulletin MM119.



ACRO

METAL STAMPING COMPANY

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General-Purpose Electrode

Known as Eutectrode 6000, a general-purpose arc welding electrode for steel sheet and plates announced by the Eutectic Welding Alloys Corp., Dept. P, 40 Worth St., New York 13, N. Y., is claimed to possess properties that provide for rapid solidification of the weld metal, thus making the electrode particularly useful for uphand welding and for single or multiple pass welding of "poor fit" joints. Its high burn-off rate is said to permit the use of high currents with resultant increase in welding speeds.

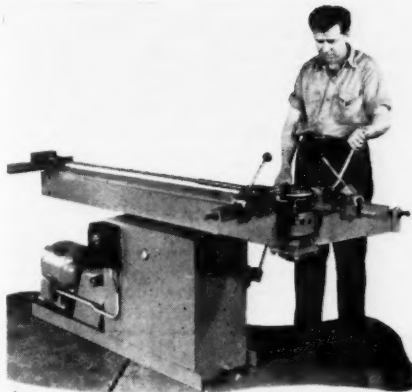
Designed for both a.c. and d.c., the electrode is provided with a FrigidArc coating that is claimed to permit welding at lowest possible heat. The finished weld is machinable as deposited or after the welded part has been heat treated. A shallow-penetrating fast-depositing elec-

trode that is available in sizes of $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, and $\frac{3}{8}$ inch. Eutectrode 6000 is said to have a Brinell hardness of 200 and a tensile strength of 64,000-72,000 lb. per square inch.

Semi-Automatic Tube Bender

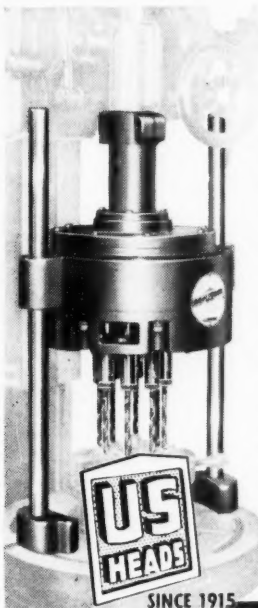
Designated as the Series 1400, a semi-automatic hydraulic bending machine announced by the Pines Engineering Co., Aurora, Ill., is designed to handle tubes and pipes up to 5 feet in length but can be easily extended to accommodate any length of tube. The maximum rated capacity of the machine is for 1-inch o.d. 16 gauge steel tubing, with a maximum bending radius of $8\frac{1}{2}$ inches to the center line of the tube. The machine can be easily tooled to handle serpentine and stacked coil bends and can be readily adapted to tubing, pipes, and bars, as well as rolled or extruded sections.

The unit utilizes a draw bending principle which is said to produce high quality bends without wrinkles or distortion and permit the handling of a wide variety of work. The movements of the machine are controlled by two toggle-operated hand clamping levers and one man-



Pines Series 1400 Semi-Automatic Tube Bending Machine

ual hydraulic valve control lever which are mounted at a convenient height for the operator. An adjustable angle-of-bend turret permits easy, instantaneous selection of any one of four preset angles of bends.



Designed for You!

ADJUSTAFIX MULTIPLE SPINDLE DRILL HEAD

This head is designed to reduce drastically multiple drilling costs by eliminating expensive changes in set-up from job to job.

As much as 90% of the drill head can be left intact, yet a complete engineering change-over is accomplished by simply changing the drill pattern plate and relocating spindles on the new pattern plate to conform to the new design.

The spindle and idler constructions are entirely separate assemblies both being self contained. For this reason, the use of compound gears on the idler shaft gives exactly the tool speed required for a given job. No change of gearing is necessary in the main drive box when tool speed is changed.

THE ADJUSTAFIX MULTIPLE SPINDLE DRILL HEAD can be easily installed on the machines you are now using, and can be used not only for drilling, but for tapping, reaming, spot-facing, boring, counterboring, and milling operations as desired.

ALL ADJUSTAFIX MULTIPLE heads have fully automatic lubrication for either horizontal or vertical operation.

UNITED STATES DRILL HEAD CO. 616 Burns Street,
CINCINNATI 4, OHIO

• We manufacture all types of multiple spindle, fixed center, adjustable and lead screw tapping heads.

The bender is mounted on a welded steel pedestal 18 x 40 inches which serves as a reservoir for the hydraulic oil and as a base for mounting the motor, Vickers pump, and control valves. The total overall floor space required is 3 x 7 feet.

Die-Set Handling Equipment

Designed to minimize the difficult, awkward, repeated handling of dies in process, the Bowman Die-Processor now being manufactured by Bowman Products,

Use Dial Indicators?



Here is a magnetic stand that will save you time. Base area less than square inch, yet guaranteed permanent magnet hangs on with 30 lbs. force. Easily removed. Highly accessible because of small size. Use it on money back trial.

Send for circular.

RAYMOND E. ROOF
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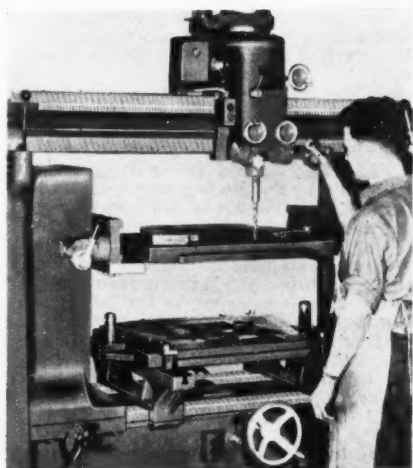


SOMERSET Radius Dresser SAVES TIME

Thousands of Somerset Dressers in service. Offer outstanding features — Wheel is dressed from below, avoids removal of guard. Stop pins permit rotation thru 180° or 90° either direction. Wear ever bearing is dustproof.

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SOMERSET TOOL CO. 320 Virginia St. Hillside, N. J.



Bowman Die-Processor with Punch Holder Elevated on Index Plates and with Overhead Drill in Position for Drilling Operation

Inc., University & Cromwell Aves., St. Paul 4, Minn., is available in two sizes: for die sets up to 42 inches long and for die sets up to 36 inches wide with shut height of 5½ inches and with die shoe on parallel tables. Sets of greater shut height may be fully swiveled by quick and easy removal of the shoe and parallel rails.

Once a die set has been placed within the stocks of the Bowman Die-Processor and on its tables, all the work of handling, lifting, swinging, and adjusting is mechanized. The overhead drill included in the design of the unit has a capacity of 1 inch with infinitely variable speed motor drive and with two-speed geared head transmission. The range of the drill

TOOL MAKERS SELF LOCKING BORING CHUCK - - - \$15.00

Body Diameter—1½"; length 1⅞"
Shank Diameter—½"; length 1½"
Tool Movement—⅜" adjustable in thousandths
Tool Diameter—⅜"

Hardened and tempered screw, tool block and shank.

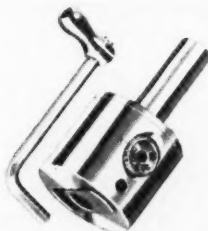
SPECIAL SHANKS AVAILABLE

F.O.B. Manchester

SMITH BORING CHUCK CO.

Box 69

Manchester, Connecticut



head is the complete area of both holders in die sets.

All essential electrical and manual controls and locks are duplicated on both sides of the Die-Processor, thus permitting two-sided or two-man operation. A 110-volt outlet is provided on the front and back of the unit for portable power tools, inspection lights, and so on.

Soldering Salts

Described as pure white crystals which can be instantly dissolved in two parts water or more, providing the user with a flux of any strength desired to meet the requirements of the job, soldering salts containing spirits of metal are being marketed under the trade name of Farco by the Farrelloy Co., Dept. MMS, 1235 N. 26th St., Philadelphia 21, Pa. According to the manufacturer, the spirits of metal contained in the salts increases the attraction between the atoms of the molten solder and the metal surface to which it is applied, thereby increasing the wetting action on the metal and also increasing the tinned surface and the tensile strength of the bond.

Farco Salts are said to provide an efficient flux for soldering galvanized iron, steel, brass, copper or any common metals and are claimed to be excellent for cleaning and retaining the tin or soldering irons.

Coil Cradle and Stock Straightener

The U. S. Model PDSC-1240 Automatic Power Driven Coil Cradle and Stock Straightener shown in the accompanying illustration, product of the U. S. Tool Co., Inc., Ampere (East Orange), N. J., is designed to accommodate material up to 12 inches in width, up to $\frac{1}{4}$ inch in thickness, and coils with a maximum o.d. of 40 inches. Stock to be straightened is placed on the coil cradle from where it is fed to the straightening unit which has a pair of power driven hardened and ground feed-in rolls, as well as ten straightening rolls,

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON

Stub Length Double-End End Mills

NEW!—Stock Items

A new line of small double-end end mills, with flutes shorter than regular, offer these advantages:

GREATER STRENGTH • LONGER TOOL LIFE

FAR LESS BREAKAGE • FASTER FEEDS

Same high Weldon quality in 2- and 4-flute styles.

For complete list send for Folder No. STM-1

THE WELDON TOOL CO.

Cleveland, Ohio

3000 WOODHILL ROAD

... just right for size

CHAMPION

expanding
mandrels



accurate • dependable • economical

Simply move the flexible sleeve on the taper arbor and get thousands of variations for holes from $\frac{1}{2}$ " to $6\frac{1}{2}$ ". Sizes are 1 to 12 with large and small sleeves for sizes 6 to 12. Write for data sheet today. Dept. M.M.

The WESTERN Tool & Mfg. Co., Springfield, Ohio

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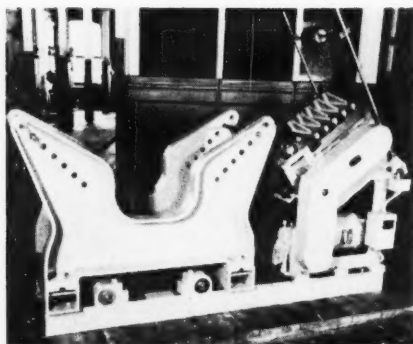
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- COOLD CHISELS
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- PUNCHES
- OTHER HAND TOOLS

Made of cast aluminum. Tools of various sizes held by spring pressure. Available for holding tools from $\frac{1}{4}$ " to $1\frac{1}{4}$ " square. Write for data sheets and prices.

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SAFETY STEEL STAMPS

158 East Carson Street • Pittsburgh 19, Pa.



U. S. Model PDSC-1240 Automatic Power Driven Coil Cradle and Stock Straightener

the lower five of which are also driven. Constructed to occupy a minimum of floor space, the unit is furnished complete with a mercury switch control arrangement and $1\frac{1}{2}$ h.p. drive motor.

Improved Magnetic Coolant Separator

Changes in the design of its Barnesdrill Magnetic Coolant Separator to improve its overall efficiency and widen its application have been announced by

Barnesdrill Improved Magnetic Coolant Separator



the Barnes Drill Co., 860 Chestnut St., Rockford, Ill. These changes apply to the 5, 10, 20, and 40 g.p.m. sizes.

The new rectangular shape of the separator is said to present a pleasing appearance for installation with any machine. The floor space required has been reduced to a minimum. A small 1/20 h.p. gearmotor has replaced the fractional horsepower motor with worm drive and housing, thus reducing power consumption to a minimum. Moreover, the new lightweight construction with the aluminum housing is said to have greatly reduced the weight of the separator, thereby facilitating installation and providing for maximum economy in transportation.

Convenience of installation is also claimed to be much greater with the direct intake of used coolant from the work and discharge of clean coolant from either side of the separator direct to the coolant storage tank. The improved separator is designed for lower level intake, thus eliminating the necessity of an extra pump to deliver the used coolant to it. On the 20-gallon size, the used coolant intake is 10 1/4 inches from the floor and the outlet for clean coolant, 6 3/4 inches minimum. The height is adjustable to suit requirements.

Automatic Gear Shaver Loader

The National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich., has announced an automatic gear shaver loader which is designed to permit all

types of external transmission gears to be shaved regardless of size, including cluster and stem gears, as well as timing gears. Machines equipped with the automatic loader are said to operate continuously as long as the magazine is kept filled with work.

The accompanying illustration shows the loader installed on a Red Ring Model GCU diagonal gear shaving machine which is arranged to shave a 32-tooth constant mesh transmission gear at the end of a cluster. The gear is of the helical type having a 3.765 pitch diameter, 10.5

Fiske "Magic" Compound

A Water Soluble Cutting Coolant in Paste Form

Fiske "MAGIC" Compound, when dissolved in water, cools, lubricates, produces a high finish and lengthens tool life. There is nothing else like it for milling, drilling, grinding, turning, sawing, threading, wire drawing and stamping. It is rust resistant, stays mixed and will not become rancid. Try it and see the improvement in your work.

There is a Fiske Lubricant for every metal working operation. Each is an outstanding product and results in more production, better finish and increased tool life. Let us solve your special problems. Write today to Fiske Brothers Refining Co., 131 Lockwood Street, Newark 5, N. J., or 1502 Oakdale Avenue, Toledo 5, Ohio.



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The high quality and accuracy of Standard Steel Specialty Taper Pins have won them wide acceptance. Milled from bar stock, straight to taper and to extremely close tolerances, these pins give 100% performance. The uniformity and accuracy of the pins saves valuable time at assembly, assuring you trouble free service.

Write for complete catalog giving information on taper pins, Woodruff keys, machine keys and machine racks.

**STANDARD STEEL SPECIALTY
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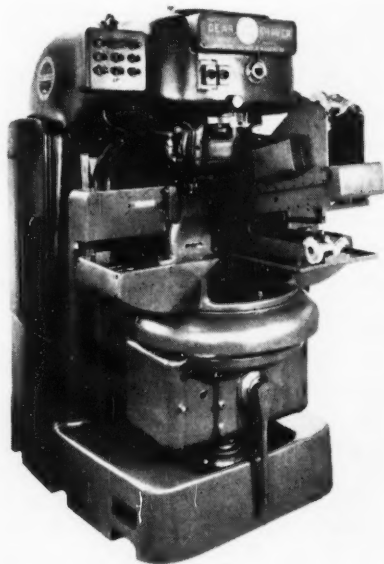
BEAVER FALLS

PENNSYLVANIA

PLANTS: BEAVER FALLS, PA. • HAMMOND, IND.

diametral pitch, and $\frac{5}{8}$ -inch face. The blank is 5.809 inches long overall with a 0.875-inch diameter broached hole running throughout its length. The actual floor to floor time said to be required for this operation is 16 seconds or a rate of 191 gears per hour at 85 per cent efficiency. The three smaller gears of the cluster can also be shaved on the machine at comparable production rates using the same loader and merely changing the set-up.

The design of the automatic loader



"Red Ring" Model GCU Diagonal Gear Shaver
Equipped with Automatic Loader

varies, depending upon the type of gear to be shaved and the overall dimensions of the blank.

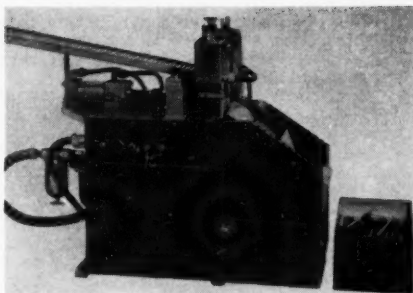
Hand Knobs

A complete line of cast iron hand knobs with black Pentrate finish is now being marketed by the Northwestern Tool & Engineering Co., 119 Hollier St., Dayton 3, Ohio. Made in star and hexagon types, the knobs can be obtained plain, tapped, or reamed in sizes from $\frac{1}{4}$ up to $\frac{3}{4}$ inch inside diameter.

Electronic Sorting and Gaging Equipment

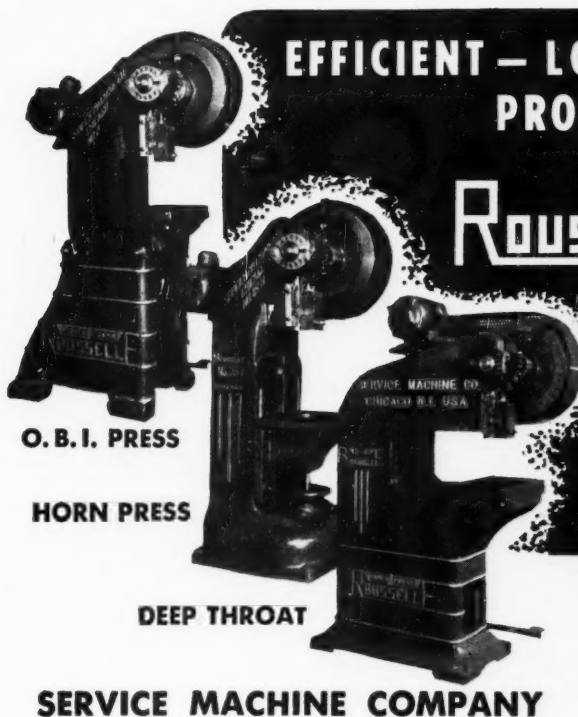
The Brown & Sharpe Mfg. Co., Providence 1, R. I., has announced facilities for the building of special automatic and semi-automatic inspecting and sorting equipment of simple, sturdy construction. Machines can be made to meet individual needs for volume of product and may be of the manual loading and disposal type, manual loading and automatic disposal type, and automatic loading and automatic disposal type. The machines are said to be capable of segregating a product into any number of categories, and each category can be of any dimensional "width."

The machine illustrated herewith is designed to gage and sort straight sleeves, measuring for length and diameter at both ends. The sleeves are measured into four categories: (1) oversize and undersize in length regardless of



Brown & Sharpe Electronic Sorting and Gaging Machine

diameter, (2) small in diameter at either or both ends, (3) either or both ends large in diameter, and (4) good sleeves, within tolerance. The machine, which is of the manually-loaded automatic dispos-



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PRESSES**

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DEEP THROAT

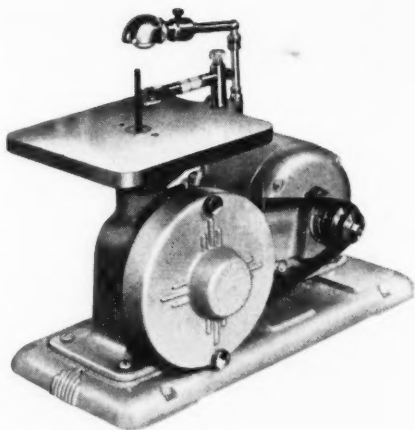
SERVICE MACHINE COMPANY

**7633
S. Ashland Ave.
Chicago 20**

al type, is said to have a production rate of approximately 3,000 pieces per hour. The capacity is adjustable for different lengths and diameters of parts.

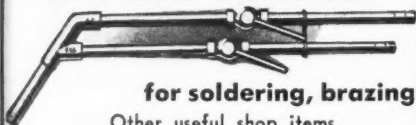
Die Filer

A die filing machine designed to utilize either $\frac{1}{8}$ or $\frac{1}{4}$ -inch shank files has been introduced by the Benchmaster Mfg. Co., 2952 W. Pico Blvd., Los Angeles 6, Calif. The stroke length is variable from $\frac{1}{16}$ to $\frac{3}{4}$ inch by means of a double eccentric. A re-



Benchmaster Die Filer

BRAZING TORCHES

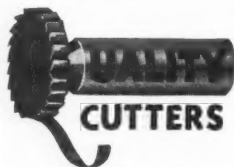


for soldering, brazing

Other useful shop items.

Write for illustrated circular.

BUFFALO DENTAL MANUFACTURING CO.
Buffalo 3, New York



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All standard sizes carried in stock for immediate delivery. Special cutters made to Blue Print.

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QUALITY TOOL WORKS
WAUKEGAN ILLINOIS

movable belt guard encloses the stroke adjusting device.

The reciprocating mechanism of the machine is spring loaded, automatically compensating for wear. To keep filings out of the bearing surrounding the reciprocating shaft, a special Neoprene bellows is provided. Both crank and pulley shafts are supported in ball bearings which are lubricated by a built-in reservoir. A visual indicator shows oil level at all times.

The $8\frac{1}{2}$ -inch square table of the machine tilts front and back, permitting accurate filing for clearance on dies, and so on. A graduated plate provides for accurate table settings. The file is backed up with an adjustable roller support. Ample illumination is afforded by a built-in swivel-jointed lamp.

Said to operate satisfactorily with

A NEW WRENCH!



Patented

HERE is the first PRACTICAL INTERNAL WRENCH ever developed to really perform an old task MUCH BETTER. In every shop where socket screws are used, it's truly a genuine time saver. Uses standard drivers. Made right and priced right. Write for illustrated chart showing all sizes. Sales are direct.

L. C. DOMACK 1149 Milwaukee Ave. CHICAGO 22, ILL.

either a $\frac{1}{16}$ or $\frac{1}{4}$ h.p. motor, the machine is equipped with a V-belt drive, guarded for maximum protection.

Industrial Floor-Dry Product

For use in dimly lighted corners in machine shops, in sections around dark colored machines, in parts of a plant far from illuminating sources, and in other dark areas for increasing illumination, the Eagle-Picher Co., Cincinnati 1, Ohio, is marketing an industrial floor-dry product which is said to reflect a large part of the light striking it.

The material is applied in dry, granular form and is said to possess the property of keeping its reflective ability even when soaked with oil or water. While absorbing fluids, the material is also claimed to continue to provide a firm surface for wheel or foot traffic within a plant. Moreover, when swept up after being fully saturated, the material is said to leave a dry, clean floor.

Special Hydraulic Die Table

To meet the requirements of a particular die handling job, the Lyon-Raymond Corp., 2740 Madison St., Greene, N. Y., redesigned its standard hydraulic elevating table to include a top 31 inches wide x 42 inches long. Thirteen rollers set on 3-inch centers extend slightly above the side channels so that large over-

hanging dies can be handled. A single removable retaining bar prevents dies from rolling off the open end of the table. To pull dies from presses and storage racks, a 35 to 1 ratio hand winch with 15 feet of steel cable is furnished.

The table can be elevated from a low-er position of 22 inches to a maximum height of 30 inches. A single speed foot pump enables an operator to easily and accurately position dies weighing as much as 2,000 lb. Two 5-inch diameter swivel casters and two 5-inch rigid casters provide for easy rolling of the table. A floor lock holds the unit firmly in posi-



ONE good reason why our customers keep coming back to us when they need gears or special machinery is because we give them exactly the kind of work they want. Our gears are cut precisely to your specifications of any practical material in a variety of sizes ranging from inches up to 30 feet in diameter.

Our gears will measure up to your standards of quality and workmanship. And they will do the job you want them to do—efficiently and economically.

Why not send us your drawings and specifications and let us show you what we can do? We are sure that you, too, will return—again and again.

The Earle Gear & Machine Co., 4723 Stenton Ave., Philadelphia 44, Pa.; Sales Offices: 149 Broadway, New York 6, N. Y.;

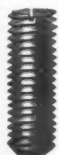
IT'S GOOD BUSINESS
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Earle



USE ECONOMY

Headless
Set
Screws



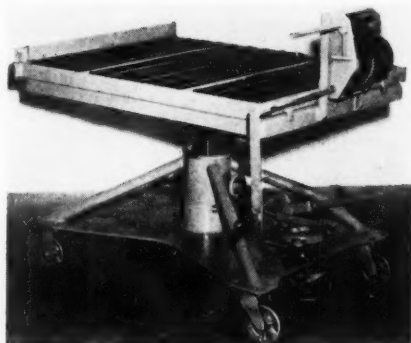
Socket
Set Screws



Try Them On Your Next Job!

**ECONOMY
MACHINE PRODUCTS
COMPANY**

5212 Lawrence Ave., Chicago 30, Ill.



Lyon-Raymond Special Hydraulic Die Table

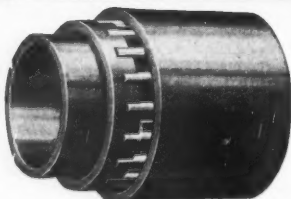
tion for die transfer work. A die separating device consisting of an overhead rack with suspended chains can be furnished as extra equipment.

Band Saw Blade Brazier

For making band saw blades from coiled stock or for repairing such blades, The Erwood Co., 212 Woodstock St., Crystal Lake, Ill., is marketing the Erwood Electro Band Saw Blade Brazier which is available in two models: Model No. 101-B with shipping weight of 10 lb. and designed for 110-120-volt 50-60-cycle opera-

Erwood Electro Band Saw Blade Brazier

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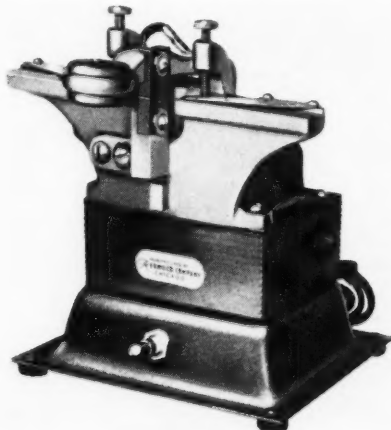
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thrust bearings.

"Serving Industry For 37 Years"

THE GWILLIAM COMPANY

358 Furman St. Brooklyn 2, N.Y.

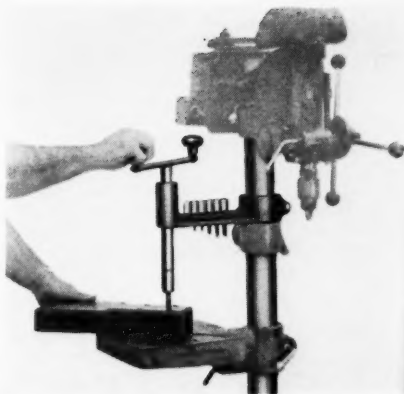


tion, and Model No. 102-B with shipping weight of 10 lb. and designed for 220-250-volt 50-60-cycle operation.

Claimed to produce, in less than 2 minutes, a resistance brazed joint that will withstand hard service, the unit is said to simplify and make possible inside sawing. Light in weight and simple in operation, the brazer is supplied in a kit complete with silver alloy and flux.

Hand Tapper

Paragon Metal Products, 416 S. Broadway, Los Angeles 13, Calif., has announced a hand tapping machine which is claimed to eliminate tap breakage and speed up tapping operations in the tool-room and die shop. Furnished complete, ready to use, the unit can be quickly mounted on a drill press column as a permanent fixture if desired, thus enabling the drill press to not only serve for drilling purposes but also as a precision tapping machine. By utilizing the drill press table and column, a precision tapping machine having the following features is said to be obtained: adjustable "tap to table" clearance of from 0 to 48



Paragon Precision Hand Tapper Installed on a Drill Press

inches; 3½-inch spindle guide bearing to assure right-angle tapping at all times; full 7½-inch depth of throat; and ready mounting facilities.

The Paragon Hand Tapping Machine is furnished complete with seven quick-

Your Hardness Tester...



IS ONLY AS GOOD AS THE DIAMOND IT USES

Dependably accurate "Rockwell" testing results are obtained only when every part of your hardness testing equipment is made to precision limits. That is why a correctly designed diamond penetrator is of such great importance. Always specify CLARK Diamond Cone Penetrators, both for Standard and for Superficial "Rockwell" testing. They are accurately made to the proper size and shape; exactly formed by expert lappers. CLARK Penetrators are designed for use on all "Rockwell" type testing machines.

CLARK
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INSTRUMENT, INC.

10200 Ford Road

Dearborn, Mich.

change tap adapters in sizes of 8-32, 10-24, $\frac{1}{4}$ inch, $\frac{5}{16}$ inch, $\frac{3}{8}$ inch, $\frac{7}{8}$ inch, and $\frac{1}{2}$ inch.



LC Wrench

Socket Head Wrench

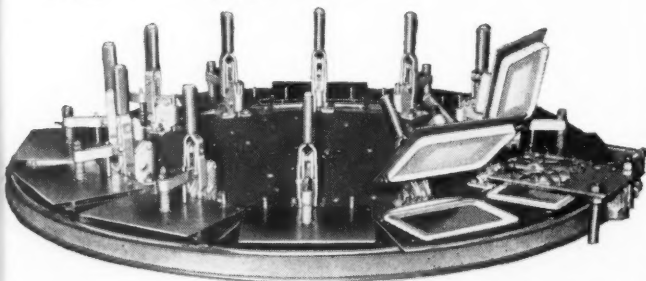
A socket head wrench comprising an adequate length hex firmly set into a sturdy base is being marketed under the designation LC by L. C. Domack, 1149 Milwaukee Ave., Chicago 22, Ill. The hex

is interchangeable in the event of breakage or wear, and the base is knurled to provide a firm grip for hand turning under oily conditions.

The LC Wrench is available in the form of a set consisting of five wrenches in hex sizes of $\frac{3}{32}$, $\frac{1}{8}$, $\frac{5}{16}$, $\frac{3}{4}$, and $\frac{1}{2}$ inch, all designed for use with a $\frac{3}{8}$ -inch driver. The set also includes an aluminum stand for the wrenches.



*The Merry-Go-Round
that Never Broke Down..*



No, this "Merry-go-round" never broke down, but it does break production bottlenecks every day, thanks to versatile De-Sta-Co Toggle Clamps!

It's a high-production assembly fixture for a new plastic ink pad. Here, the bottom of the case is being bonded to the body. Requirements: fast bonding cycle . . . positive clamping pressure for a perfect bond . . . precise alignment of work pieces for accurate assembly. Rapid toggle action, sure holding pressure, rugged durability and well-engineered design make De-Sta-Co No. 207U Toggle Clamps the tool designer's logical choice for this application.

And they're the logical choice, too, for holding parts during

• Assembly • Welding • Riveting • Machining

of plastics, metal and other materials. Whatever your work-holding problem, there's a De-Sta-Co Toggle Clamp that's a "natural" to solve it. The complete line of more than 40 stationary and portable De-Sta-Co Toggle Clamps is shown in Clamp Catalog No. 49. Send for your copy today, and the name of our stocking representative nearest you.

DETROIT STAMPING CO.

349 MIDLAND AVE.

DETROIT 3, MICHIGAN

Welding Alloy

The Eutectic Welding Alloys Corp., Dept. P, 40 Worth St., New York 13, N. Y., is now producing a welding alloy that is particularly adapted for single carbon arc welding and can be safely used to weld galvanized surfaces without damage to the coating. Known as EutecRod 189, the alloy may be used with or without flux to produce distortion-free welds on steel, bronze, and copper.

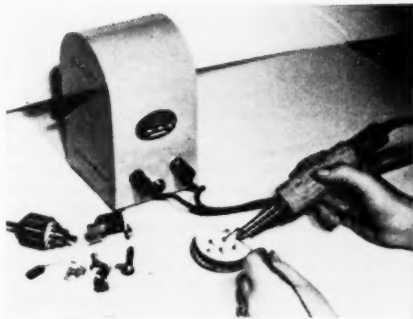
According to the manufacturer, EutecRod 189 has close color match to most red and phosphor bronzes and requires little or no preheating for thin parts. The alloy, which is said to bond at 1,550 deg. F. and have a tensile strength of 51,000 p.s.i. is available in diameters of $\frac{3}{32}$, $\frac{1}{8}$, $\frac{5}{16}$, and $\frac{1}{4}$ inch.

Soldering Tool

Designated as the No. 551, a soldering tool for work on fractional horsepower motors, radio and television assemblies and their component parts, as well as for various other types of lightweight soldering applications, is now being manufactured by the Luma Electric Equipment Co., P. O. Box 132-MS, Toledo 1, Ohio. Operating on the resistance heating principle, the tool is designed to accommodate three different sizes of soldering electrodes ($\frac{3}{32}$, $\frac{1}{8}$, and $\frac{5}{32}$ inch in diameter) in either single or double contact type construction.

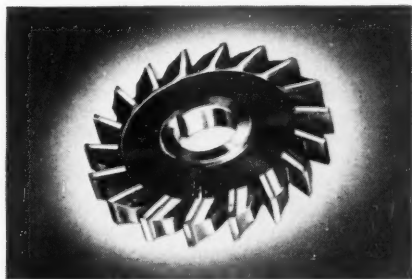
According to the manufacturer, the tool can be connected to any convenient a.c. outlet of proper voltage and cycle, and is ready for immediate use upon turning on the primary switch. Energizing current is said to be less than 10 watts. Soldering electrodes are equipped with cork grip handles for ease of handling and are extremely light in weight. The standard length of cable for each soldering electrode is 5 feet. Additional lengths of cable up to 10 feet can be used on the tool.

Said to deliver 270 watts on a continuous basis, providing ample capacity for



Luma No. 551 Soldering Tool In Use

two operators per unit with no power loss, the Luma No. 551 Soldering Tool weighs 17 lb. and is furnished enclosed in an attractive gray finish metal case. Intended for operation on 115 or 230 volts, 60-cycle a.c., the tool is supplied equipped with a 6-foot primary lead cable, primary switch, and red signal light for "off" and "on" indication.



IMPROVED DESIGN HIGH SPEED MILLING CUTTERS

Standard and special cutting tools, form cutters, slitting saws, end mills, key-seat cutters, center drills, lathe mandrels, tool bits.

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THREE RIVERS

MASSACHUSETTS

Hydraulic Elevating Table

A hydraulic elevating table which is said to enable loads up to 750 lb. to be safely transported or lifted by a single worker has been introduced by Montgomery & Co., Inc., 53 Park Place, New York 7, N. Y. Constructed of steel throughout, the table is portable but can remain fixed in any desired position. Its hydraulic jack, which is arranged to provide an elevation of $\frac{1}{4}$ inch per stroke, can be quickly removed if required.

With the table, a single operator can easily move dies in storage and to and from presses; transfer heavy work from



Montgomery Hydraulic Elevating Table

A Real Spring Winder!



Will earn its cost in one day. The Hjorth Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

No. 1 Capacity 0 thru $3/32$ " wire \$1.50

No. 2 Capacity 0 thru $3/16$ " wire \$3.00

No. 3 Capacity 0 thru $5/16$ " wire \$5.00

HJORTH LATHE & TOOL CO.

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M-D Facing Heads

With Automatic Feed

Can be attached to Boring Mill Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse; feeds automatically. Sizes 6" to 46" diameter.

Write for circular.

MUMMERT - DIXON CO.

120 PHILADELPHIA ST.

HANOVER, PA.

horizontal mills to drill presses; support and level large overhanging pieces of work on drill presses; and perform many other types of heavy material handling operations. When lowered, the table has a minimum height of 27 inches and, when raised, a maximum height of 42 inches. The table weighs 125 lb. and has a top surface measuring 28 x 19 inches.

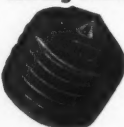
Rotary Broaches

A rotary broach with special detachable holder has been developed by the Shearcut Tool Co., P. O. Box 746, Reseda,



A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in $\frac{3}{16}$ " to 1" diameters. Send for price list.

HEIMANN MFG. CO.

330 Lincoln Ave.

Urbana, Ohio



Shear-cut Rotary Broaches with Special Holders

Calif. The broach has an internal thread which is accurately formed by a thread forming rotary broach. The end of the holder is rotary broached for a distance approximately one half the outer diameter of the broach. After hardening, the internal thread and its mating rotary broached hole are lapped to exact size so that they will fit the special threaded driving holder.

When a rotary broach becomes no longer usable, it may be readily removed from its holder and replaced with a new broach. According to the manufacturer, the rotary broaches may be resharpened from 10 to 30 times before wearing undersize and then may be hard chrome plated to restore to size.

Punch Press Feeding Device

The V & O Press Co., Hudson, N. Y., has announced the purchase of the patents, patterns, tools, and other equipment, together with the inventory and all assets, of a punch press feeding device, known as the "Feed - O - Matic."

from the Covert Mfg. Co., Troy, New York.

The device, now called the V & O Feed-O-Matic, is intended for attachment to punch presses or other machine tools. By means of a mechanical hand or a vacuum pickup, the machine transfers a part from a nesting plate and places it in a standard punch press die. As the mechanical hand returns for the next piece, it automatically trips the press and the finished part is ejected from the die. The mechanical hand is arranged to place the blanks accurately in the die, with resulting long die life. The moving arm is

GOT ANY DIFFICULT RECESSING JOBS?

Do Them Easily with SCULLY-JONES standard AUTOMATIC RECESSING TOOLS

(Three Types—Five Sizes)

You can do any of these with Scully-Jones Standard Automatic Recessing Tools: re-tainer ring grooves; reliefs for tapping, threading, grinding, honing; chamfers; second operations on cast or molded parts, or a combination of these operations.

Scully-Jones Standard Type "R"—size 2R Automatic Recessing Tool. Sizes 2R, 4R, and 5R pilot in the hole or stop on the face of the work and are used in setups where it is impractical to mount a pilot bushing.

Scully-Jones Standard Type "J" Automatic Recessing Tool. Types "J" and "C" are designed to pilot in a fixture bushing.

Send For Details Today—No Obligation
Write for a free copy of our new 28-page Manual No. 17-2.



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YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

**Immediate Delivery
FROM STOCK
GREAVES-SILENT BAKELITE GEARS**



No waiting when you order Greaves Silent Bakelite Gears. • We have them in stock NOW! • Your order will go forward immediately. • You'll appreciate the silent operation and added smoothness provided by Greaves Silent Bakelite Gears. • You'll marvel at their great strength to carry big power loads... their remarkable ability to successfully operate completely submerged in water. • You'll welcome their low cost. • No metal reinforcements required. • Save Time... Money... Labor!

We also make silent gears of rawhide and Fabrolite.

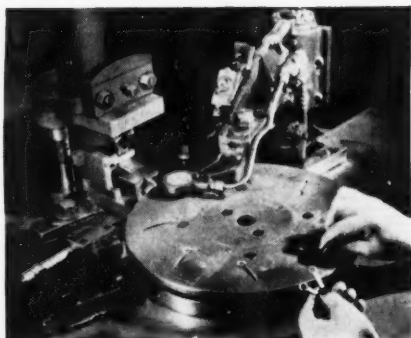
Write for Circular.

Greaves MACHINE TOOL CO.

2015 39 Eastern Ave.
Cincinnati, Ohio



FOR OWNERS CUTTING THEIR OWN GEARS WE CAN MAKE IMMEDIATE DELIVERY ON BLANKS SAWED TO SPECIFIED DIAMETER AND FACE



V & O "Feed-O-Matic" in Use

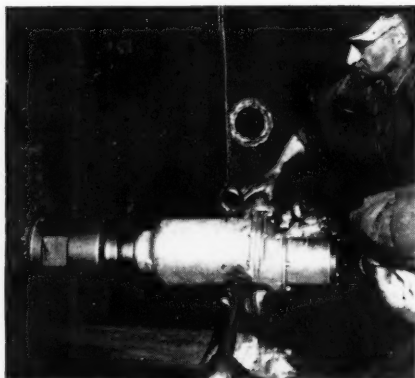
provided with a micro-switch safety feature to prevent tripping of the press unless the blank is correctly placed.

The V & O Feed-O-Matic is built in six sizes and can be attached to any make of press. It is also adapted for placing pieces into position for machine tool operations.

Large Air Impact Tool

A large air impact tool for extremely heavy bolting-up jobs, to be known as the Size 588 "Slugger," is announced by the Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. Capable of handling both maintenance and production work, the tool, which is rated up to 4-inch bolt size, is especially designed for the quick

Ingersoll-Rand Size 588 "Slugger" Impact Tool in Use




Mr. Production Superintendent—
**I CUT YOUR
LAPPING-IN-TIME
IN HALF!**

TIMECUTTER is the NEW three-way improved lapping compound.

This pre-mixed, ready-to-use compound cuts TWICE AS FAST as ordinary compounds... (by actual test)... It clings to the points of contact and really grinds... to a fine finish. Then, the silicon carbide washes off in a sludge, quickly and easily. The result... more speed on the production line.

TIMECUTTER

Write for full information about three-way improved TIMECUTTER
TIMESAVER PRODUCTS CO.
546 W. Washington Blvd. Chicago 6, Illinois



repair of heavy equipment and to reduce the time required in the manufacture of all types of machinery involving large studs, bolts and nuts.

The Size 588 Slugger weighs 215 lb. and has a free speed of 355 r.p.m., with 550 impacts per minute. The overall length to the shoulder of the anvil is 26 $\frac{1}{2}$ inches; the side to center distance of the hammer case is 4 inches. Designed for operation with a 2 $\frac{1}{2}$ -inch square driver, the tool is furnished complete with a safety live air handle with independent reverse; suspension ring; and dead handle.



Wendt-Sonis Solid Carbide End Mill

is available in a straight or spiral flute design in sizes ranging from $\frac{1}{8}$ inch to $\frac{1}{2}$ inch in diameter.

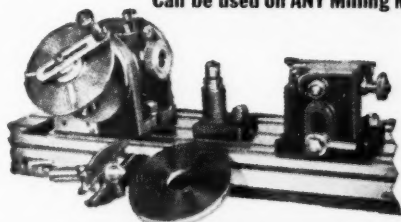
Solid Carbide End Mill

Designed for the production cutting of close tolerance slots and keyways in cast iron, mild heat-treated steels, and all types of non-ferrous and non-metallic materials, an end mill formed from solid carbide has been developed by the Wendt-Sonis Co., Hannibal, Mo. The outstanding feature claimed for the tool is the unusual resistance to wear provided by the solid carbide.

According to the manufacturer, the tool can be used repeatedly after being ground to smaller cutting diameters, the solid carbide providing for maximum strength and safety in operation. Ample length flutes with smooth contours are said to allow for fast chip removal regardless of the depth of cut. The Wendt-Sonis Solid Carbide End Mill

CUT MILLING COSTS *With* KEMPSMITH STANDARD ATTACHMENTS

Universal DIVIDING HEAD Can be used on ANY Milling Machine



A Kemp Smith Universal Dividing Head is a precision tool, designed and built to retain accuracy. Combines simplicity and convenience with rigidity and accuracy. High number indexing attachment, spiral cutting mechanism and chuck with adapter also available. Ask for Bulletin No. 119.

Kemp Smith Standard Attachments broaden the scope of your milling machine . . . lower capital investment . . . save in set-up time.

KEMPSMITH MACHINE CO.
1835 SOUTH 71st STREET
MILWAUKEE 14, WIS., U.S.A.



KEMPSMITH
ARBORS

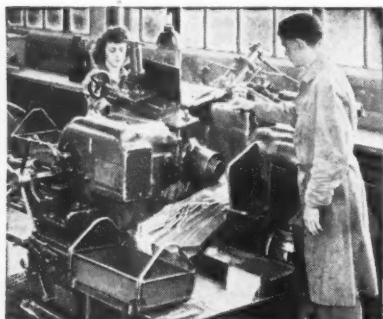
in all popular sizes or types. Adaptable to ANY make of milling machine with standardized spindle.

KEMPSMITH

Precision Built Milling Machines Since 1888

16-Inch Drill Press

As an addition to its line of "Speed-Right" drilling machines, The Electro Mechano Co., 265 E. Erie St., Milwaukee 2, Wis., has announced a 16-inch drill press which is designed to provide for the instant selection of any speed between 300 and 5,000 r.p.m. Recommended for production, toolroom, or maintenance work, the machine has a drilling capacity of approximately $\frac{1}{2}$ inch in cast iron and is equipped with a built-in $\frac{1}{2}$ h.p. motor of the ball bearing type, designed specifically to meet the varied conditions of drilling, reaming, and tapping.

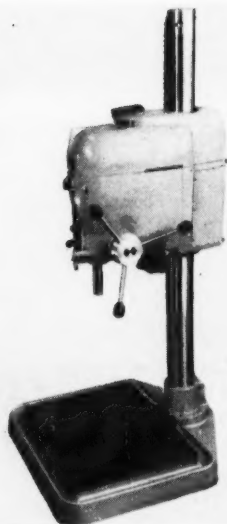


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Single or multiple diameter pieces.
High Quality Work Since 1931.
Prompt Service.

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CENTERLESS
GRINDING CO.**

6605 Cedar Ave., Phone: EN 3412, CLEVELAND 3, O.



Electro Mechano "Speed-Right" 16-Inch Drill Press

Precision helical gears on the spindle allow for the selection of direct or geared motor drive. A micro drill depth stop with clamp-type lock allows for instant and positive setting to any desired drill depth. Where long production runs do not require any change in spindle speed, the machine can be obtained with a fixed speed induction type motor.

Miniature Ball Bearing

Identified as the Type R-073, an extremely small annular ball bearing for use in instruments, subminiature motors,

TO INCREASE PRODUCTION AND TO IMPROVE EFFICIENCY USE BUTTERFLY FILING AND DIE MAKING MACHINES

This is a powerful machine for heavy or small precision work in use all over the world: Airplane Factories, Ammunition Plants, Toolrooms where fast production is desired. 4 Models, No. 16, No. 14 "EL" and Model "D." The larger the Model, the bigger the stroke and therefore more filing is performed. Furnished with or without pedestals. Constructed as per specification of U. S. Naval Aircraft Factories.

HARVEY MFG. CORP.

161 Grand St., New York,

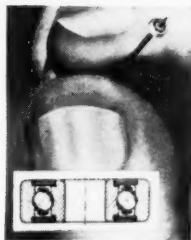
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IMITATIONS**

*Our machine
carries the
Butterfly
trade mark.*

**Registered
U.S. Patent
Office**



Type R-073 Miniature Ball Bearing

laboratory apparatus, testing devices, aircraft instruments, and other products having small moving parts is available from Landis & Gyr, Inc., 104 Fifth Ave., New York 11, N. Y. The bearing has uninterrupted raceways and is provided with a separator to assure uniform load dis-

justment of the head, and, by having the lead screw off center of the head, the length of the boring bars used can be adjusted for shallow or deep hole boring.

The head is made of hardened and ground alloy tool steel and has maximum bearing surfaces to reduce chatter on heavy cuts to a minimum. Extension attachments furnished for the larger and intermediate sizes of the head are claimed to increase the capacity 50 per cent. Facing operations are performed with the use of a removable collar which is available for each size of the head. The collar, knurled for easy handling and provided with a safety flange, contains retractable

tribution while at the same time reducing internal friction, and with double shield for dust protection.

The outside diameter of the bearing is 3 mm. (0.1181 inch) and the bore is 0.75 mm. (.0295 inch). The seven evenly spaced balls have a diameter of $\frac{1}{2}$ mm. (0.0197 inch). Designed to accommodate radial and thrust loads, the bearing is made of chrome steel and ground on all functional surfaces.

Offset Boring Head

An offset boring head constructed for accuracy and ease of operation is being offered in three convenient sizes for use in any type of boring machine or turret lathe by the Everede Tool Co., Dept. MMS, 2000-06 N. Parkside Ave., Chicago 38, Ill. A direct-reading friction type dial is said to assure quick, accurate ad-



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SMALL PARTS
MANUFACTURER!**

**a Faster Way
of Purchasing**

**Special Diameter
REPLACEABLE PILOT COUNTERBORES**

Manufacturers of cameras, clocks, guns, typewriters, adding machines, etc., will appreciate a new idea, inaugurated by Fuller, that saves valuable time and avoids needless correspondence in the purchasing of *Special Diameter COUNTERBORES* from $\frac{1}{8}$ to 1 inch. With our new Graduated Price List, you can predetermine the exact cost before ordering counterbores to your blueprint specifications. Delivery—in approximately three weeks from receipt of order.

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812 CANAL ST. • PITTSBURGH, PA.

Odd number
of flutes

$\frac{1}{16}$ "
to
1"
dia.



SOLID CARBIDE REAMERS

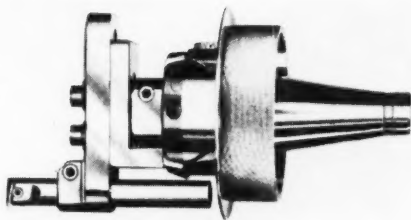
Radius relief
chamfer

All lands are
highly lapped

Outstanding
performance

Ask for Bulletin A-62

THE ATRAX CO.
Newington, Conn.



Everede Offset Boring Head Equipped with Facing and Extension Attachments

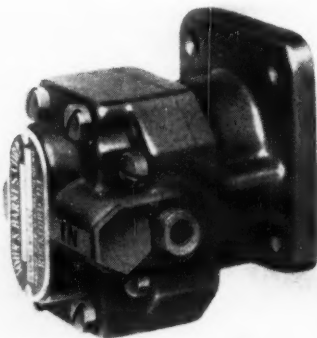
pins that permit either a 0.0025 or 0.005-inch feed per revolution.

All sizes of the boring head utilize straight shank Everede jig boring bars equipped with triangular tool bits of solid carbide, tantung, Stellite, or high speed steel.

Rotary Gear Pump

Designed particularly for use on power units, trucks, material handling equipment, and so on, a high pressure rotary gear pump which is claimed to maintain satisfactory continuous pressure up to 1,000 p.s.i. and intermittent pressure up to 1,500 p.s.i. has been added to its "Constant-Flo" line by the John S. Barnes Corp., 154 Walnut St., Rockford, Ill. The pump embodies an anti-friction bearing design and is said to provide an extremely high mechanical and volumetric efficiency.

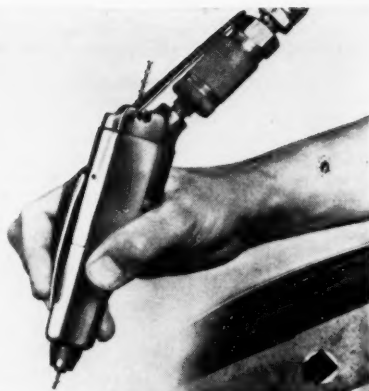
Barnes "Constant-Flo" Rotary Gear Pump



Rotary Pneumatic Tool

The Independent Pneumatic Tool Co., 175 N. State St., Aurora, Ill., has added to its "Thor" line a rotary pneumatic tool specially designed to drive "screwsticks" (a development of American Screw Co., Providence, R. I.) which comprise a series of hexagon head screws joined head end to thread end and available in sizes from No. 0 to No. 4. The tool, which weighs 1½ lb. and measures 6½ inches long, has a spindle offset of ⅜ inch and can be easily converted from one size to another.

Outstanding features of the tool include a rotary pneumatic motor with one-piece rotor and shaft mounted on precision ball and roller bearings; clutch gear of the permanently engaged type, with momentary engagement type clutch gear available if specified; feeding pawls made of high quality tempered spring steel and mounted close to the driving point to assure positive feed and use of maximum amount of screws on stick; maximum visibility due to nose end design; quiet operation; low air consumption; ball type leakproof throttle valve; hose connection threads in cast-in steel inserts; hardened steel bushings in body of driver to guide

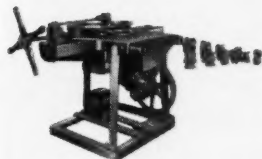


"Thor" Rotary Pneumatic Tool

screwsticks; ball for vertical suspension mounted in pressed-in steel inserts; and structural elements made from alloy steel, heat treated to render maximum service. A long, readily available throttle lever and special flexible air hose supplied with the tool add to its ease of handling.



Hand-Powered
"American" A-30



Motor-Powered
"American" 2PB

bend pipe by hand or power with

"American"

cold pipe, conduit and heavy wall tube

BENDING MACHINES

Fast... Simple... Dependable...

RADIANT HEAT BENDS in Standard Pipe

Fast . . . Accurate . . . Average bend takes only 60 seconds!
Up to 180° bends . . . all sizes from ½" to 2". Usual radiant heat bends for 1¼" at 6" and 9" radii can be supplied. Only 7 parts. Occupies 18" x 18" floor space.

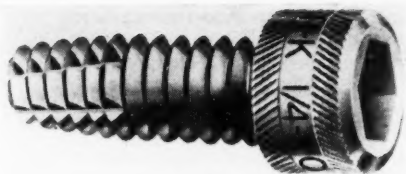
Capacity ½" to 2" standard pipe . . . Minimum radius 5 times pipe diameter up to 180° . . . Maximum radius 13". Complete with rolls for each size pipe. Standard motor equipment 2-h.p.

Special radii supplied
on request.

"American"
PIPE BENDING MACHINE
Company, INC.
Factory and Main Offices:
14 Furnace St., Poultney, Vt.

Self-Tapping Socket Head Cap Screw

Described as a combination of the size-marked socket head common to the standard P-K cap screw and the thread body of the regular P-K Type "F" self-tapping screw which cuts a thread in a plain drilled hole in metal and plastics as the screw is turned in, a self-tapping socket head cap screw that is said to be easy to use and entirely satisfactory for many socket screw applications which do not require exceedingly high stress concentrations has been developed by the



Parker-Kalon Self-Tapping Socket Head Cap Screw

Parker-Kalon Corp., 200 Varick St., New York 14, New York.

**NOW YOU
CAN HAVE...**



An Economically priced **AUTOMATIC BAR FEEDER** for your Band Saw — the **Wells-O-Bar FEED MASTER**

Owners of Wells No. 8 and No. 12 Machines or other horizontal metal cutting band saws can now convert these units into fully automatic bar stock cut-off machines at very modest cost. The new Wells-O-Bar Feed Master accurately feeds bar stock in a variety of shapes and sizes

into the machine and automatically controls the saw frame through each cutting and resetting cycle. Requires only 60 to 80 pounds air pressure. Safety features eliminate necessity of constant attention. Write for details and prices.



Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
808 TYLER ST. - THREE RIVERS, MICH.

According to the manufacturer, the screw can be readily removed and replaced in the same hole any number of times without materially reducing its holding power, and is particularly suitable for fastening many parts which must be removed for servicing.

Stud Welder

A single gun welding machine announced by the Graham Mfg. Corp., 1541 E. 8 Mile Rd., Ferndale 20, Mich., incorporates a capacitor-operated self-timed device using tip studs which, on coming in contact with the work and fusing, cause ionization which, in turn, allows a path for the main discharge current of the capacitor to form an arc sufficient to melt both the full diameter of the stud end and the workpiece directly under same. This operation is followed by the necessary hammer blow to cause the pieces to be welded. The complete cycle

is effected by a rapid, continuous movement of the stud-holding part, no retarding means being employed. The time of arc is about one mil second, thus making possible the use of very high currents.

Said to allow studs to be welded on the back of plated or painted surfaces without marring same, the Graham Stud Welder can be operated by unskilled workers and may be used in welding steel, stainless steel, Monel, aluminum,



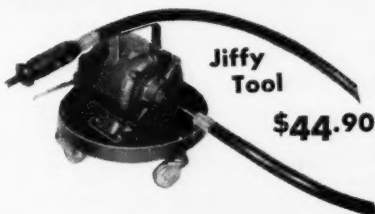
Graham Stud Welder

magnesium, zinc, copper, and, in some cases, combinations of these metals and alloys. Overall dimensions of the welder cabinet are 38 $\frac{1}{4}$ x 24 x 16 inches.

Metric Thread Dial

A thread dial designed especially to aid in cutting metric screw threads on lathes equipped with metric lead screws has been announced by the South Bend Lathe Works, 386 E. Madison St., South Bend 22, Ind. The attachment is said to save considerable time when cutting long screw threads. Instead of reversing the lathe to return the cutting tool to the starting point, the half nuts may be opened and the carriage moved quickly

New portable power tools



STOW JIFFY TOOLS

IDEAL FOR:

- BUFFING
- FILING
- SANDING
- ROUTING
- GRINDING
- BRUSHING



With these power machines, you bring the tool to the job, instead of the job to the tool. And Stow Jiffy Tools are priced so low that no tool room or shop need do without one!

Write for Stow's free Bulletin 494 containing full information.

STOW

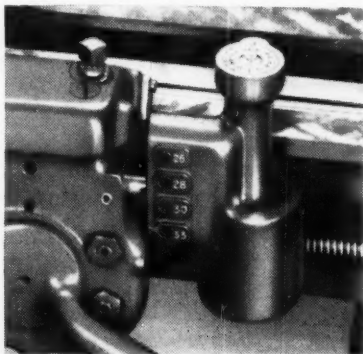
MANUFACTURING CO.

1 Shear St., Binghamton, N. Y.

by hand. The graduated dial shows when to engage the half nuts so that the cutting tool will follow the original cut.

To provide for the various pitches of metric screw threads, several gears having different numbers of teeth are mounted on the lower end of the thread dial shaft. The vertical position of the thread dial is changed as required so that the correct gear for the pitch of the thread to be cut will mesh with the lead screw. Each graduation on the dial is marked with a letter indicating the points at which the half nuts may be engaged for certain threads. A chart is supplied with

the thread dial to show which gear and which graduations must be used for each pitch of metric screw thread.

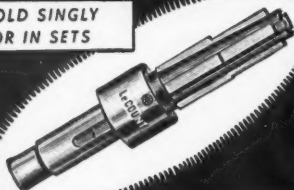


Metric Thread Dial for South Bend 9-Inch Metric Lathe

The thread dial is now available for South Bend 9-inch swing lathes having metric lead screws and is being developed for other sizes.

LE COUNT'S EXPANDING MANDRELS

SOLD SINGLY
OR IN SETS



For use on Lathes, Grinders or Milling Machines for increased production and also a Time Saver in the Tool Room. Qwik action—no arbor press required. Designed for Accuracy, Strength and Long Service. No fragile parts to wear out. The three blades used in construction correct any inaccuracy of the bore. A set of 6 will take bores from $\frac{3}{8}$ inch to 4 inch inclusive. Extra keys can be furnished on No. 5 Mandrel for bores to 7 inches.

W. G. LE COUNT TOOL WORKS

SO. NORWALK, CONN., U. S. A.

Phase Converter

Designed to enable three phase motors to be used where only single phase current is available, the Withey Phase Converter illustrated herewith is being distributed by M. C. Wickham, Goodrich, Mich. The converter shown is intended for use with No. 5 and $7\frac{1}{2}$ h.p. motors and is furnished in a plain, substantial steel case measuring 12 x 8 x 4 inches and weighing 47 lb. Other sizes available include 5 h.p., 3 h.p., combined 2 and $1\frac{1}{2}$

AERO SPIRAL FLUTE

STOP CHATTER

Cut clean and accurately. Stocked in 60, 82, 90, 100 degree included angle. Check specification chart. Lower prices in quantities. Send for catalog sheet. If not available from your mill supply dealer, order direct.

AERO TOOL COMPANY
D-11, 6948 Avalon Blvd., Los Angeles 3, Calif.



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| No. | Cutter Dia. | Shank | Price |
|--------|------------------|-----------------|--------|
| 1909-2 | $\frac{3}{8}$ " | $\frac{1}{4}$ " | \$1.50 |
| 1909-3 | $\frac{1}{2}$ " | $\frac{1}{4}$ " | 1.80 |
| 1909-4 | $\frac{5}{8}$ " | $\frac{1}{4}$ " | 2.40 |
| 1909-5 | $\frac{3}{4}$ " | $\frac{1}{2}$ " | 3.10 |
| 1909-6 | 1" | $\frac{1}{2}$ " | 4.60 |
| 1909-7 | $1\frac{1}{8}$ " | $\frac{1}{2}$ " | 6.60 |
| 1909-8 | $1\frac{1}{4}$ " | $\frac{1}{2}$ " | 7.00 |



Withey Phase Converter

h.p., combined 1 and $\frac{3}{4}$ h.p., and $\frac{1}{2}$ h.p. In case two or more motors of small size are to be run simultaneously, they may

be operated from one converter provided it has the capacity of their combined horsepower.

The Withey Phase Converter is automatic and is said to require no maintenance. The only moving part is a small relay that is properly adjusted at the factory prior to shipment.

Socket Screw Key Sets

The Holo-Krome Screw Corp., Hartford 10, Conn., has announced the availability of five socket screw key sets in attractive Plastic Paks which are light in weight yet strong and durable and have snap fasteners on the covers. For convenience, some of the key sets have individual pockets for the keys.

The short arm series keys in Sets Nos. 6 and 7 are said to be ideal for servicemen on instruments, motors, and practically all types of equipment where small diameter screws are used. The long arm series keys in Sets Nos. 107 and 113 are useful for electrical appliance work and numerous other light jobs. The extra long arm series keys in Set No. 103 are designed to meet the demands of servicemen on oil burners and other equipment having hard-to-get-at screws. Sets Nos.

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DAYTON, OHIO

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SHREVEPORT, LA.

Dixie Mill Supply
Co., Inc.
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ST. LOUIS 8, MO.

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Machy, Co.
3713 Washington Blvd.

SYRACUSE 2, N. Y.

Briggs, C. H. Mach.
Tool Co., Inc.
Onondaga Hotel Bldg.

W. HARTFORD 7, CT.

Rudel Machinery Co., Inc.
7 South Main St.

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, R. I.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

Handiest

TOOL HOLDER MADE



On tapping and reaming jobs, you'll find it much easier to make accurate set-ups with the Ziegler Tool Holder for one simple reason. The Ziegler automatically corrects inaccuracies up to 1/32" radius or 1/16" diameter.

Try the Ziegler on your next job. You'll say it's the handiest tool holder you ever used.

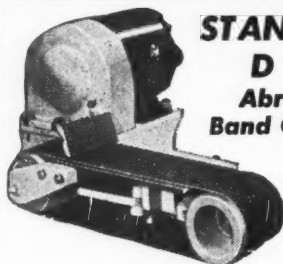
W. M. ZIEGLER TOOL CO.

13570 Auburn, Detroit 23, Mich.

Ziegler
ROLLER
DRIVE

WRITE FOR
CATALOG

FLOATING HOLDER
for Taps and Reamers...



STANDARD

D - 4

**Abrasive
Band Grinder**

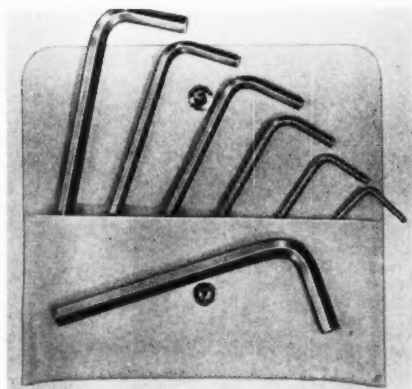
Famous
for
Stamino

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36 1/4" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW
MANUAL ON FINISHING—WRITE TODAY

WALLS SALES CORP.

306 E. 38th St., New York 16, N. Y.



Holo-Krome Socket Screw Key Set

44 and 66 are furnished in heavy gauge metal boxes with crackle enamel finish, hinged snap-on covers, and metal separators to permit grouping of keys to size.

The keys are made of special analysis nickel alloy steel, correctly proportioned to provide proper leverage and scientifically designed to avoid corner strain.

Toggle Clamp

Ace Tool Service, 2240 N. 65th St., Milwaukee 13, Wis., has announced a quick-acting toggle clamp specially designed

Ace Toggle Clamp



for use in performing welding, nibbling, profiling, drill press, toolroom, and other operations on sheet metal, structural iron, and other materials. Said to be capable of exerting a pressure of over 1,000 p.s.i., the clamp consists of a manganese bronze body with toggle mechanism and adjustable hardened set screw.

The clamp is available in 7 sizes with throat capacities from 3 to 8 inches. Openings range from 1 to 3 inches. The Model No. 304 illustrated herewith has a capacity of 3 x 4 inches and weighs approximately 3 lb. The overall length is 7½ inches.

Tool Bits and Cutoff Blades

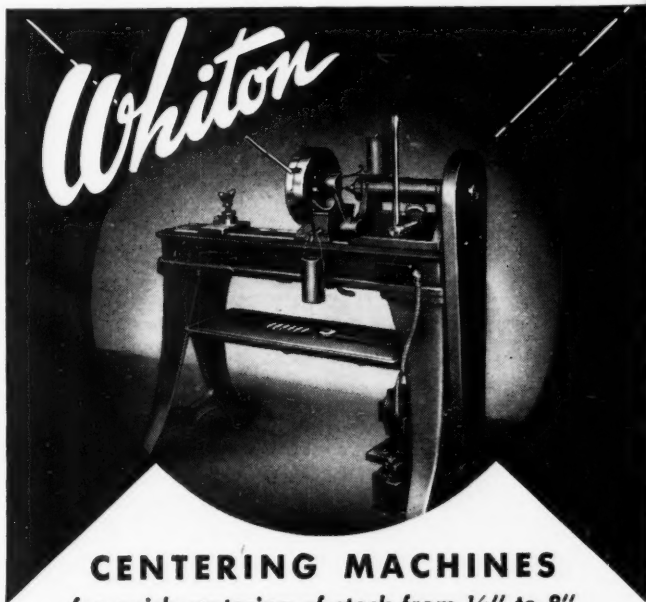
"Lucky 13" is the trade name of a series of cutting tools, comprising tool bits and cutoff blades, which is now being offered by Plew Tool & Metal Heat Treat, South Line St., Columbia City, Ind. The tools are claimed to have a hardness of Rockwell C-66-68 and a tensile strength of over 300,000 lb. per square inch.

Standard ground square tool bits are available in sizes from ⅞ inch square x 2 inches in length up to and including 1 x 7 inches. Standard ground flat tool bits range in size from ¼ x ⅝ x 3 to 1 x 1¼ x 6 inches. Ground cutoff blades are available in sizes from ⅝ x ½ x 5 to ⅞ x 1 x 6½ inches. Special sizes of bits and blades can be obtained on order.

Pilot Valves

A series of small, economical pilot valves for the direct control of small cylinders or automatic control of large cylinders has been announced by the Hanna Engineering Works, 1765 Elston Ave., Chicago 22, Ill. The valves are available in cam, lever, push-button, and foot-operated types. All are three-way valves except the foot-operated units which are four-way.

Cam-operated valves each feature a spring-loaded roller which can be actuated by a straight line or rotary cam. The roller can be rotated 90 degrees. In



3 or 4 jaw lever operated universal chucks center and hold work. A standard tapered hole in the spindle provides for holding combination or twist drills of suitable size. Spindle traverse is actuated by a feed lever. Machine is completely motorized. Also available are single spindle single head screw feed floor and bench types as well as single spindle double head centering machines. Write for Bulletin C-1 now.



THE WHITON MACHINE COMPANY
NEW LONDON, CONN., U.S.A.

Makers of Fine Chucks • Special Purpose Milling Machines
Gear Cutting Machines • Steam Turbines

the lever-operated valve, the lever can be rotated 90 degrees. The push-button valve is compactly made, thus making it particularly useful for control panel installations.

Single and double-pedal foot-operated pilot valves offer convenient hand-free control of cylinders. The double-pedal type provides for full control of both directions of movement of the cylinder; the single pedal valve affords semi-automatic



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Shipment
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- CAPACITIES UP TO 20 INCHES
- BORING BARS UP TO 1½ INCHES
- FINE MICROMETER ADJUSTMENT
- PRICES INCLUDE SHANK AND BARS

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THE MAXWELL CO.

327 BROADWAY • BEDFORD, OHIO



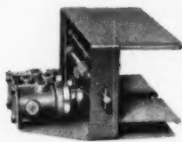
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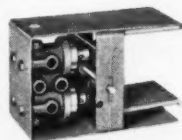
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PUSH
BUTTON



DOUBLE PEDAL



SINGLE PEDAL

Hanna Pilot Valves

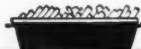
control. Automatic control of large cylinders is achieved with pilot valves through Hanna Mastair valves.

Metal-Cutting Band Saw

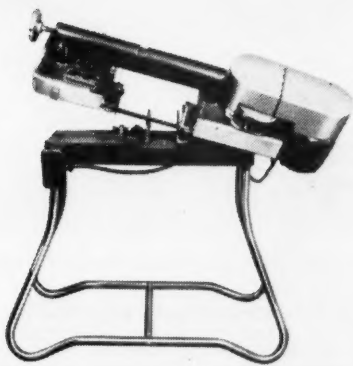
Designed as the Model 49A and designed especially for small shops and for general utility work in large shops, a metal-cutting band saw with capacity of 3½ inches for rounds and 3½ x 6½ inches for rectangular shapes has been an-

New Nesting Type TOTE PANS

20" Long x 12"
Wide x 6¼" Deep
16 Ga., drag holes,
handles both ends.



J. L. LUCAS & SON, INC.
BRIDGEPORT 5, CONN.



Wells Model 49A Metal-Cutting Band Saw

nounced by the Wells Mfg. Corp., 808 Tyler Ave., Three Rivers, Michigan.

The blade ($\frac{1}{2}$ inch x 0.025 inch x 5 feet) is driven by a $\frac{1}{6}$ h.p. ball bearing motor with manual starter and automatic stop.

A V-belt drive provides selective speeds of 54, 100, and 190 f.p.m. The saw is also equipped with a quick-action vise and adjustable blade guides. The disc-type idler and drive wheels operate on grease sealed ball bearings. The frame and bed of the machine are of welded construction and are mounted on tubular steel legs.

The bed area of the Model 49A is $6\frac{1}{2}$ x 24 inches and the height to the top of the bed is 24 inches. The machine requires a floor space of $16\frac{1}{2}$ x 38 inches and has a net weight of approximately 118 pounds.

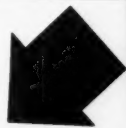
Reversible Ratchet Wrench

A heavy duty reversible ratchet wrench designed to accommodate loads with all working parts in compression has been placed on the market by Greene, Tweed & Co., Dept. MMS, Elm Ave., North Wales, Pa. Designated as the "Favorite" Deluxe, the wrench features a synthetic rubber retaining ring; one-piece built-in pawl for instant reversal of wrench direction; and angle-set of pawl and socket teeth for positive clutch fit.

The "double-head" construction of the

Baldor

GRINDERS



RUGGED-BUILT for the long, hard grind
—these Grinders have **BALANCED** rotors & wheels

BALDOR heavy-duty GRINDERS are balanced 2-ways: each rotor is dynamically balanced; each wheel is balanced with Baldor's patented flanges. Fully guaranteed. SHOWN HERE: No. 6110; $\frac{1}{3}$ hp. motor, 6" wheels (36 and 60 grit). Fully adjustable tool rests and eye-shields.

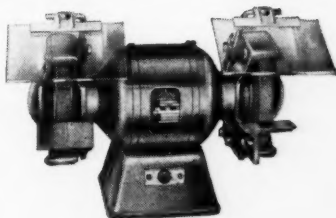
BALDOR ELECTRIC COMPANY

4380 Duncan Ave. (30th Year) St. Louis 10, Mo.

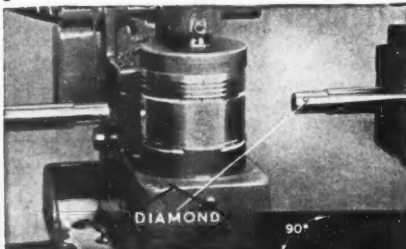
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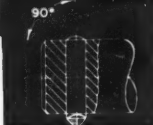
\$50.00



GILMORE DIAMOND BORING TOOLS

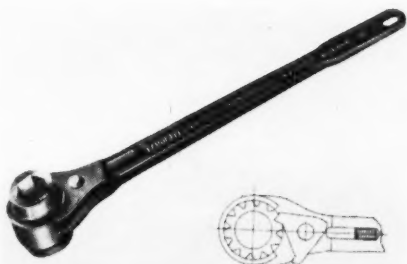


The diamonds in these tools are carefully chosen under strong magnification to make certain they have inherent qualities that render long boring service. • Write for data book on diamonds for Turning, Boring, Testing.



F. F. GILMORE CO. 285 Columbus Ave.
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Diamond-Boring, Turning, Facing, Engraving,
Truing Tools, Styli, Gage Contacts.



"Favorite" Deluxe Reversible Ratchet Wrench

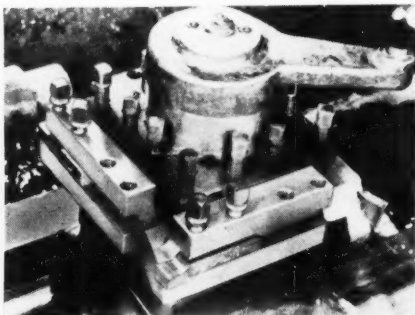
wrench provides two different size openings, each accommodating a different nut size. Straight-ahead ratchet movement eliminates lift-off at quarter turns and permits easy operation in close quarters. The free opening through the socket head enables the wrench to be used on long studs. The wrench is available with 15, 24 and 27-inch handles and with sockets to accommodate American Standard heavy nuts from $\frac{1}{4}$ to 1 $\frac{1}{2}$ -inch bolt size.

Lathe Toolholder

A toolholder available in sizes to fit most turret lathes or other lathes with square turret tool posts is now being produced by the Rusnok Tool Works, 4840 W. North Ave., Chicago 39, Ill. Designed to accommodate $\frac{1}{2}$ -inch tools which are held in place by two screws, the holder is made of hardened steel and is ruggedly constructed to allow for the taking of heavy cuts.

Intended to reduce set-up time to a minimum, the toolholder, after the cor-

Rusnok Lathe Toolholders Set Up for Use



SOME Finish!

COLONIAL BUSHINGS INC.
P.O. BOX 37, HARPER STATION
DETROIT 13, MICHIGAN

rect height is obtained by the use of the rocker arm of the tool post, permits a tool to be removed for grinding and replaced without disturbing the setup. No adjustment is necessary once the tool-holder is set up in the tool post. By using a combination of these holders, two shoulders can be faced or two diameters turned in one operation. A tool can be used from either end of the holder, thus permitting it to be employed for turning, facing, or short boring operations.

Bar Rack

A handy rack for supporting bar stock, pipes, and tubes in factories, warehouses, mill supply houses, vocational schools, and so on, is now being marketed by the Wm. S. Yohe Supply Co., 505 Gibbs Ave., N. E., Canton 4, Ohio. Cast of high grade machinery iron, the rack is available in a 4-arm type which is 51 inches high and has a solid bar capacity of 10,000 lb. and a 5-arm type which is 57 inches high and has a solid bar capacity of 12,000 lb. Each arm is designed to accommodate stock up to approximately 10 inches in diameter, the opening over hooks being 4 1/4 inches.

If desired, two racks can be placed so



Yohe Bar Racks

that the backs overlap, thus forming a double rack. When used alone, each rack occupies a floor space of 13 inches and, when placed with its back overlapping another rack, a floor space of 23 inches. Self-balancing, the racks are said to seldom require floor fastening.

HARGRAVE CLAMPS



IMPROVED SPRING CLAMP



"C" CLAMP



QUICK CLAMP



HAND SCREW



No. 640 IMPROVED "I" BAR CLAMP

INDIVIDUALLY TESTED to insure better performance . . .

Hargrave Clamps have been constantly improved with the aid of skilled mechanics to offer greater operating advantages and increased durability. Individually Tested, they must be stronger, tougher, and flaw-free. Made in openings from 3/4 in. to 10 ft., from 1/2 in. to 16 in. deep.

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showing the complete line of Hargrave Individually Tested Clamps, Chisels, Punches, Star Drills, File Cleaners, Brace Wrenches, Washer Cutters, Saw Vises, etc.

1947 Waverly Ave.
Cincinnati 12, Ohio



There is an Industrial Distributor stock near you

Small Power Press Brake

Designated as the 16-48, a small power press brake developed by the Verson All-steel Press Co., 9310 S. Kenwood Ave., Chicago 19, Ill., has a bed and ram length of 48 inches and is suitable for most all types of metal forming operations ordinarily performed on press brakes. Rated air bending capacities range from a 48-inch length of 16 gauge stock (over a $\frac{1}{2}$ -inch opening) to a 24-inch length of 10 gauge stock (over a $1\frac{1}{8}$ -inch opening).

The 16-48 is unique in that unit all-steel



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with
PERFORMANCE

FALLS PRODUCTS, INC.
124 Genoa St. Genoa, Ill.



Verson 16-48 Press Brake

construction is employed to assure accurate alignment and maximum rigidity. All gears are steel with machine cut teeth. Eccentric and intermediate shafts are mounted in solid renewable bronze bushings. A totally-enclosed friction clutch and self-releasing band brake are employed. Alemite hand fittings are provided for convenient lubrication. A variable speed arrangement is incorporated to provide for 20 to 50 strokes per minute operation. Where portability is required, the 16-48 may be mounted on casters.

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WM. H. OTTEMILLER CO.
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Lathe Tool Bit

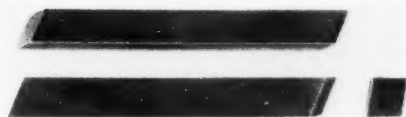
Known as the "Du-Bit," a lathe tool bit with the lead clearance and point clearance already formed in the blank (both right and left hand) to minimize

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THE PREFERRED
OFFSET BORING HEAD**

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FLYNN MANUFACTURING CO.
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Dow "Du-Bits"

grinding prior to use has been announced by The Dow Mechanical Corp., Thompsonville, Conn. Designed to fit standard holders, the bit is available in several standard high speed steel grades, ground or unground, and in a variety of standard cross-sectional sizes and lengths.

Sine Plate

A precision sine plate which is ruggedly constructed for use on boring mills, planers, and so on, in checking and machining angles on large castings and fabrications has been placed on the market by the Hoover Tool & Die Co., 20550 Hoover Rd., Detroit 5, Mich. A 30-inch rotary table can be mounted on the sine plate, thus increasing its use in boring or milling equally spaced angular holes and faces.

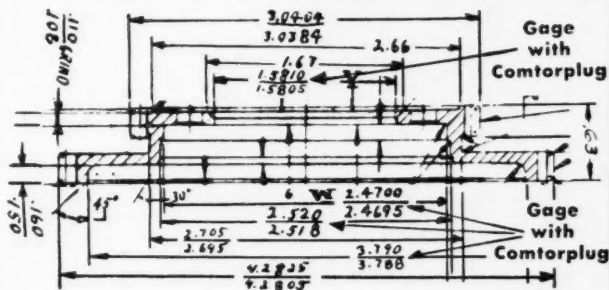
Diaphragm Relief Valve

For use in lines handling air, cold water, oil, and similar liquids at pressures up to 250 p.s.i., the C. A. Norgren Co., 222 Santa Fe Dr., Denver 9, Colo., is offering a diaphragm relief valve design-

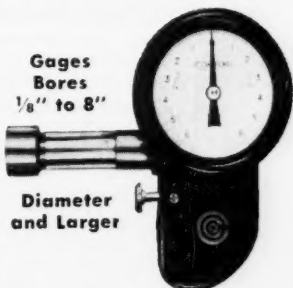
nated as the Series 62-A. When the pressure exceeds the relief setting, the diaphragm and valve seat are raised, opening the valve and releasing the air or liquid through the outlet port. Surplus liquids can be discharged to a supply tank by piping the outlet port.

All parts in contact with the air or fluid handled are brass. The synthetic rubber diaphragm, reinforced with nylon cloth, is said to be highly resistant to oil and other fluids for which the valve is recommended. The diaphragm extends to the extreme outer edges of the body and bonnet and is held firmly in place.

A "toughie" to gage — but EASY with Comtorplug



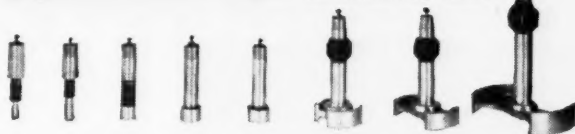
Patented Comtorplug makes all internal gaging easy. Automatic features assure true 2-point contact, at any part of hole. Shows actual size (not a passing reading), front or back taper, out-of-round, etc. Gages shallow holes or to bottom of deep blind holes.



REQUEST BULLETIN 40

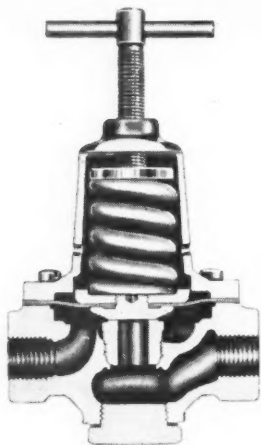
COMTOR CO.

64 Farwell Street
Waltham 54, Mass.



The valve is offered in pipe sizes of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1 inch and is available

50, 40 to 75, 75 to 125, 125 to 250, and 5 to 125 pounds per square inch, the manufacturer states.



Norgren Series 62-A Diaphragm Relief Valve

with any of 6 sizes of regulating springs for relief pressure ranges of 2 to 15, 15 to

Dial Indicator Point Selector

The L. S. Starrett Co., Athol, Mass., is offering the dial indicator point selector shown herewith, which provides a complete selection of 14 frequently used interchangeable contacts in a convenient "package" that is said to make selection and safe-keeping easy. The selection includes 14 standard and special points, each of which has a 4-48 mounting thread to fit any standard American Gage Design indicator.

The points are firmly mounted in tapped holes on an attractive lightweight aluminum ring with each contact identified by size or number stamped on the ring. The choice includes a range of 4 standard $\frac{1}{2}$ -inch diameter points $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1 inch long; 9 special shapes for measuring in holes or restricted places or for gaging on small, resilient or rough surfaces; and a shock-absorbing point with an internal spring and telescoping anvil which protect the indicator from sudden shock or blows. The points are precision made



DORMAN AUTOMATIC REVERSE TAPPERS

• **AUTOMATIC TORQUE CONTROL... One Minute to Adjust**
... Prevents Tap Breakage...
Operator Need Not Be Skilled

• **WIDE RANGE TAP CAPACITY**

No. 1 FRICTION DRIVE TAPPER
—capacity #2-56 to $\frac{3}{8}$ " in Steel— $\frac{1}{2}$ " in Aluminum.

No. 28 POSITIVE TAPPER—
capacity $\frac{3}{8}$ " to $\frac{7}{8}$ " in Steel.

No. 3A POSITIVE TAPPER—
capacity $\frac{1}{2}$ " to $1\frac{1}{4}$ " in Steel—
 $\frac{1}{2}$ " to $\frac{3}{4}$ " Pipe Taps.

No. 4A TAPPER—capacity $\frac{3}{4}$ "
to 2" in Steel including Pipe
Taps.

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STANDARD UNIVERSAL ADJUSTABLE AND SPECIAL FIXED CENTER DRILLHEADS

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STRAIGHT
BEVELS

SPROCKETS

RACKS

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GEARS

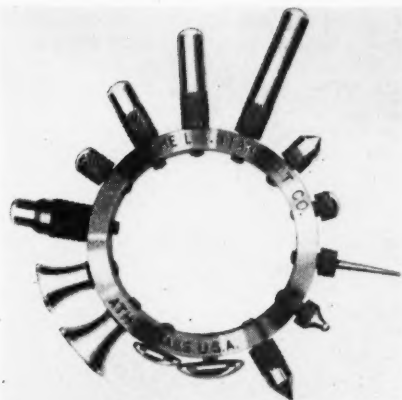
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BEAVER
GEAR WORKS, Inc.
1022 Parmele St., ROCKFORD, ILL.



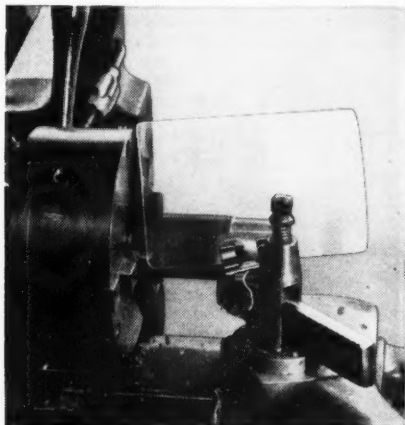
Starrett Dial Indicator Point Selector

from high grade steel and hardened, ground and chrome plated to provide for long life.

Lathe Shield

Designed to assure maximum protection to lathe operators, a Plexiglas lathe shield which can be easily attached by means of a spring clip to any cutting tool holder is being made by the Frank Gradischnig Co., 2417 N. Cramer, Milwaukee

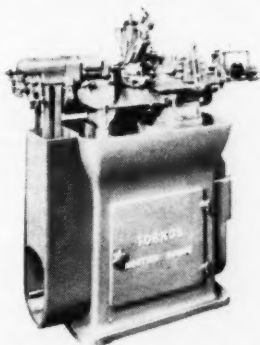
Gradischnig Lathe Shield Installed on Cutting Tool Holder



TORNOS

SWISS TYPE

PRECISION AUTOMATIC SCREW MACHINES



These machines produce a multitude of parts that cannot satisfactorily be made on conventional-type machines. Specially designed for long and thin parts requiring extreme dimensional accuracy . . . precision in the concentricity of several diameters . . . as well as the highest quality finish without subsequent machining operations.

8 VERSATILE MODELS

The Tornos line includes 8 different automatics from 5/32" up to 1-3/16" stock capacity. Available auxiliary attachments provide maximum versatility on every Tornos Automatic.



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Tornos Automatic to fit
your requirements.

TORNOS DIVISION
HAUSER
MACHINE TOOL CORP.
MANHASSET, N. Y.

11. Wis. The shield is 3 inches high x 5 inches wide and provides for full vision.

Fully and easily adjustable to any desired position, the shield deflects and concentrates chips and shavings, thereby facilitating cleaning of the lathe. The shield is furnished complete with a spring clip which is available in sizes for $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{1}{2}$ -inch cutting tool holders.

Rectifier-Type D.C. Welder

A d.c. welding machine utilizing a plate-type rectifier has been developed and placed on the market by the Westing-

house Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. The unit is rated in accordance with N.E.M.A. standards for indus-



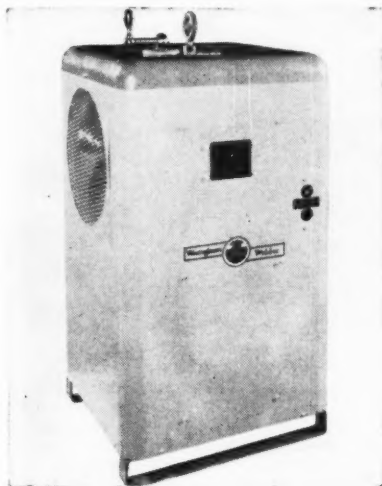
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Most modern Nibbler for Template Cutting, Tool Rooms, Shipbuilding, Aircraft Parts, Aircraft Tubing, Sheet & Plate Shops.

GRAY MACHINE CO.

Box 596, Philadelphia, Pa.

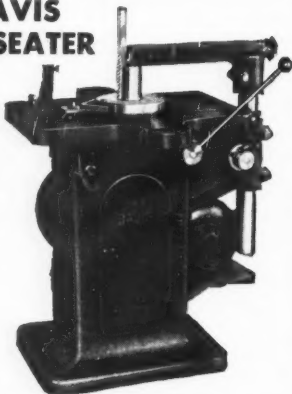


Westinghouse Rectifier-Type D.C. Welder

Why Use A Shaper to cut Keyways when a DAVIS KEYSEATER

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DAVIS KEYSEATER CO.

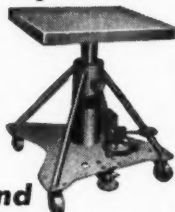
Exchange and Glasgow Sts.
ROCHESTER, N. Y.

trial type, single-operator arc welders and is available in 200, 300, and 400-ampere ratings.

Major components of the welder include a three-phase welding transformer, three-phase adjustable reactor, and plate-type (selenium) three-phase full-wave rectifier. The no-load loss in the 300-ampere model is 500 watts. The efficiency of the welder at full load is 66 per cent, with the efficiency increasing at reduced load conditions until reaching 73 per cent at 20 per cent rated load.

LYON - Raymond

SHEET FEEDING
and
DIE HANDLING
TABLES

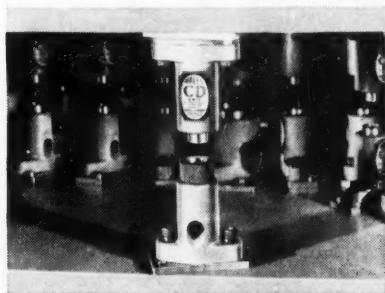


LYON-Raymond

Corporation, 3921 Madison St., Greene, N.Y.

Adapters for Hole Punching Units

Adapters for use with Wales Type "CD" Hole Punching Units designed to punch round or shaped holes up to 1½



Close-Up View of Wales Type "CD" Hole Punching Unit Mounted in Die Set with Adapters

inches in diameter in ¼-inch mild steel are announced by the Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y. According to the manufac-

turer, the adapters eliminate the necessity of large ground steel plates and accurate hole drilling equipment; assure extreme accuracy of hole locations by mounting and permanently dowsing Type CD hole punching units to die sets; permit the use of Type CD units in combination with blanking and forming dies; and provide easy mounting for permanent dies.

Die Head for Valve Seat Rings

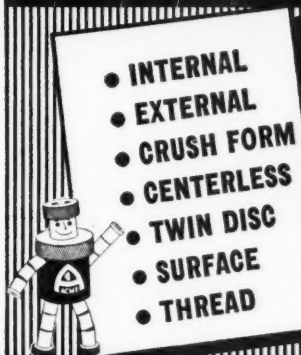
The Landis Machine Co., Waynesboro, Pa., has developed an internal-trip type die head for threading valve seat rings up to diameters of 14½ inches. Designated as the "Landmatic" 40AXX, the die head is normally furnished without the internal trip when the valve seat rings are chucked and faced in relation to the chuck. This arrangement permits setting the stops on the turret so as to allow the normal pull-off action to trip the die head.

For thread sizes larger than 9⅝ inches in diameter, an enlarged closing ring is mounted on the head to support the oversize chaser holders. Varying thread lengths of different valve seat rings can

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PRECISION GRINDING

FAST SERVICE... EXPERT WORKMANSHIP... LOW COST



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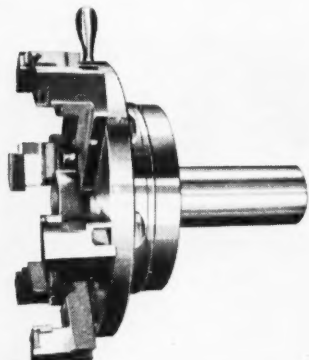


CONTINUOUS HINGES

Manufactured by
**AUTO MOULDING
& MFG. CO.**

WRITE FOR STOCK LIST
1114 E. 87TH ST. CHICAGO 19

be accommodated by the height of the oversize holders, which have a diametrical adjustment of approximately 5%

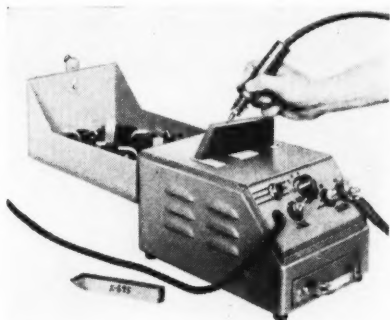


"Landmatic" 40AXX Die Head

inch on the larger size, thus permitting the same chaser holders and chasers to be used for different diameters. The chasers used are 6 per set having a 30-degree short roughing and finishing throat.

Etcher and Demagnetizer

The Crown Industrial Products Co., 1320 W. 69th St., Chicago 36, Ill., announces a combination etcher and demag-



Crown Combination Etcher and Demagnetizer

netizer designed to permit the marking and demagnetizing of tools in one operation. The cover may be tilted back or re-

moved for ease in using the unit. Fourteen etching heats ranging from 90 to 1,350 watts are provided, allowing for the marking of items made of iron, steel or its alloys.

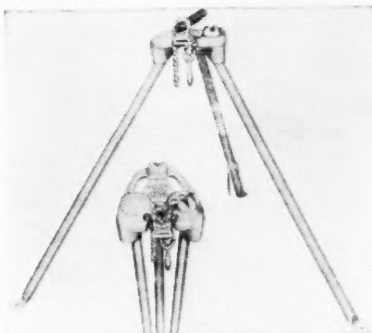
Magnetism can be removed from drills, cutters, punches, and so on, simply by placing the piece on the work plate. The demagnetizing capacity is 5 amperes. The unit has a work plate of $8\frac{3}{4}$ x $7\frac{3}{4}$ inches. A ground clamp and lead are furnished for etching pieces too large to be placed on the machine itself. The unit can be furnished to operate on either 115 or 230 volts, 50-60 cycle alternating current.

Combination Vise Stand and Pipe Bender

The accompanying illustration shows a combination vise stand and pipe bender now being marketed by J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y. The base is made from special aluminum alloy having high tensile and high impact properties, and is heavily reinforced to prevent distortion under severe service.

Two pipe benders are provided, one for pipe up to $\frac{1}{2}$ inch and the other for pipe up to $\frac{3}{4}$ inch. A recess for oilcan and

handy slots for tools are provided in the design of the stand, in addition to a "V" pipe support. The aluminum alloy legs of



Williams Combination Vise Stand and Pipe Bender

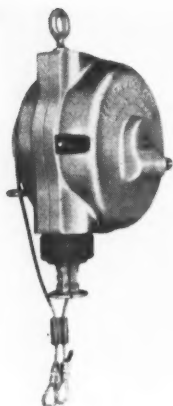
the stand may be folded and tied together with a permanently attached chain. The pipe vise provided is a Williams No. 1 "Vulcan" with capacity for pipe from $\frac{1}{8}$ to 2 inches.

Over 100,000 Dollars Sales In These Territories

Boston, New York, Philadelphia, Pittsburgh, Buffalo, Cleveland, Dayton, Detroit, Indianapolis, Chicago, Milwaukee, St. Paul, Rock Island, St. Louis, Los Angeles, on a NEW IMPROVED TOOL, HIGHEST QUALITY. You can give the best Service with a complete Local Stock and assembly. LOWEST PRICE. 40 per cent to the Representative. Cost of Stock and Facilities, \$15,000.00.

Write for Interview to

BOX NO. 115, MODERN MACHINE SHOP
431 Main Street Cincinnati 2, Ohio



Keller Heavy Duty
Tool Balancer

Heavy Duty Tool Balancer

A tool balancer of 20 lb. capacity is announced by the Keller Tool Co., Grand Haven, Mich. The balancer, which is designed to suspend tools weighing up to 20 lb. over work areas, is claimed to materially reduce loss of production time, protect workers from fatigue, and eliminate careless tool handling.

Type Holder

Designated as the Model No. 22, a steel type holder for the light duty marking of brass, aluminum, cold rolled steel, and so on, is being manufactured by the Numberall Stamp & Tool Co., Huguenot Park, Staten Island 12, N. Y. All sizes of characters up to $\frac{1}{2}$ inch high can be used

interchangeably in the holder, which is made of alloy steel and tempered to prevent mushrooming.

The type used is notched and is held firmly in place in the holder by a hooked rod. The type can be rapidly changed by simply removing the hooked rod. A single blow of a hammer on the end of a holder is said to provide for a uniform and evenly spaced mark. The holder is available in different slot sizes, each of which is designed to hold 6 sizes of type.

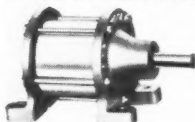


Numberall
Model No. 22
Type Holder

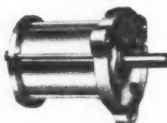
Portable Dump Box

Particularly adapted to the handling of small parts, bulk materials, and scrap, a portable dump box with round bottom is announced by the Equipment Mfg. Co., 21550 Hoover Rd., Detroit 5, Mich. The unit is constructed of heavy sheet steel completely reinforced, and includes handholds which provide for tilting the box

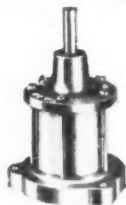
SINGLE ACTING



PARALLEL



VERTICAL FACE



VERTICAL

AIR-MITE AIR CYLINDERS

Available in PARALLEL, VERTICAL, VERTICAL FACE, CLEVIS MOUNTED . . . 1 1/2", 2 1/4", 3", 4" and 5" diameters; strokes optional. Speed up production . . . reduce operator fatigue the modern way.

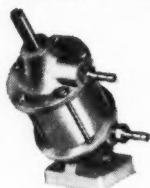
A new catalog of Air-Mite Cylinder and Arbor Presses is on the press. Write for your copy.

AIR-MITE

2651-G West Lake
Chicago 12, Illinois



CLEVIS

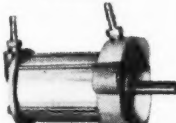


CLEVIS

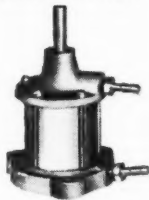
DOUBLE ACTING



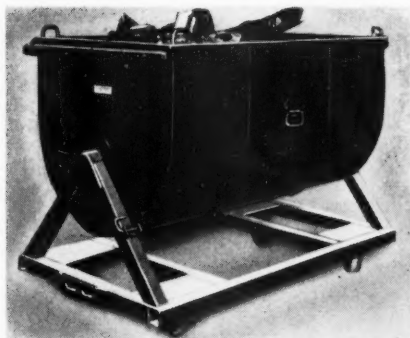
PARALLEL



VERTICAL FACE



VERTICAL



Portable Dump Box

up to 90 degrees. The round bottom is said to facilitate unloading as well as cleaning of the box. Safety catches hold the box firmly at loaded or tilted positions.

The frame and truck are of square welded tubing equipped with casters mounted on bearings. Tow plates on the frame are optional.

Vertical Drum Lifter

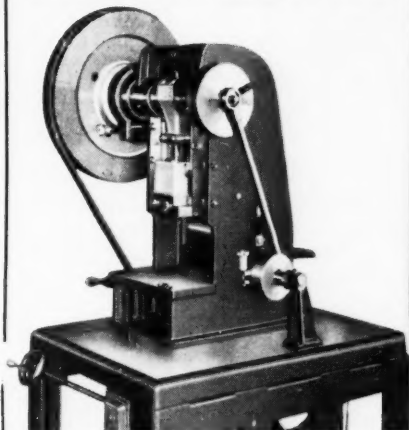
For handling open and closed steel drums in the vertical position with a crane or hoist, the Palmer-Shile Co., 16022 Fullerton Ave., Detroit 27, Mich., is offering the device shown in the accom-

Palmer-Shile Vertical Drum Lifter



NEW

Outstanding Addition to AUTOMATIC FLEXOPRESS LINE



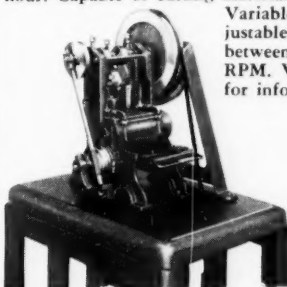
12 TON PRESS

The success of the Automatic 1½ to 2 ton press prompted many inquiries for a larger press. Now we can announce the addition of the new 12 ton press to our standard line. High speed, completely automatic and capable of cutting materials in lengths up to 12".

1½ TO 2 TONS

The 1½ to 2 ton press completely automatic. Can produce 9,000 to 40,000 pieces per hour. Capable of cutting materials up to 9".

Variable speed, adjustable to values between 150 to 600 RPM. Write today for information.



Ace Tool & Die Works

129 E. McMICKEN AVE., CINCINNATI 10, O.

panying illustration. The lifter is of all-steel construction with a heavily welded chain.

Bin Unit

Lyon Metal Products, Inc., Aurora, Ill., has announced a bin unit for flat storage, tool storage, box and small parts storage, and display of parts or small bulk or packaged items. The unit is 3 feet wide x 1 foot deep x 6½ feet high and is finished in green baked-on enamel. Dividers are adjustable horizontally every

Accurate Hole Transfer Made Easy With **NIELSEN TRANSFER SCREWS**

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 8 sizes, from ⅜" to ⅝" U.S.S. Inexpensive — Last for years.



Write for Circular
**NIELSEN TOOL &
DIE COMPANY**

1960 W. Eleven Mile Rd.
Berkley, Mich.

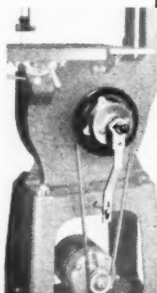
CUT METAL on your Woodworking Band Saw with

with the **ERWOOD**

PLANI-DRIVE Converter

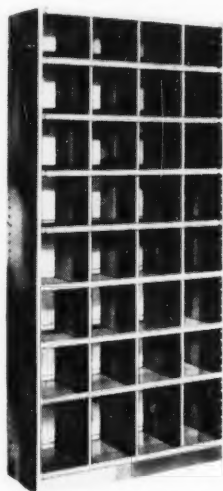
- Cut metal or wood with easy push-pull knob control.
- Fits ¾" shaft . . . is supplied with ½" and ⅝" bushings.
- Easy to install . . . remove pulley and put on converter.
- Priced so that you cannot afford to be without it . . .

\$29⁷⁵



MANUFACTURED BY THE **ERWOOD COMPANY**

213 WOODSTOCK STREET • CRYSTAL LAKE, ILLINOIS



Lyon 78-Inch Bin Unit

inch using Lyon "Snap-Ins." Shelves are adjustable up and down every 1½ inches where dividers are not used, and are also reversible to allow for flat or bin type storage.

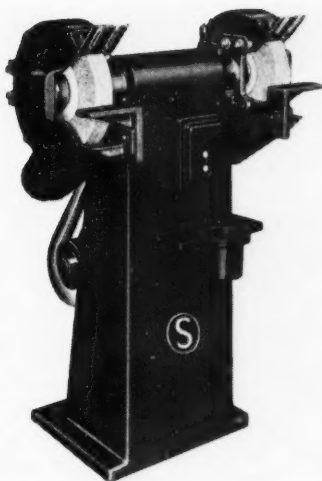
The 78-inch height of the Lyon Bin Unit permits quick and easy accessibility to all bins. The unit is available in eight different styles and can be furnished with a variety of accessories, including shelf boxes and sloping bins and dividers.

Double End Grinder

Designed to provide for maximum economy and efficiency in grinding wheel performance, a multiple speed double end

**& PRESSES
FEEDS
AUTOMATIC
EQUIPMENT**

The V&O Press Company
HUDSON, NEW YORK



"Standard" Type BDG Double End Grinder

grinder, designated as the Type BDG, is being offered in 10, 12, and 14-inch sizes by The Standard Electrical Tool Co., 2487

River Rd., Cincinnati 4, Ohio.

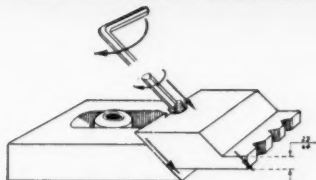
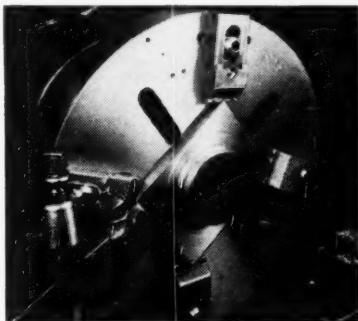
The model illustrated herewith is provided with three spindle speeds to maintain a speed of 6,500 s.f.p.m. when vitrified bonded wheels are used and 9,500 s.f.p.m. when using resinoid bonded wheels. As a wheel reduces in diameter, an interlocking arrangement provides for a change in speed to return the worn wheel to its original efficiency. With this arrangement, maximum efficiency can be obtained from wheels reduced to as small as 5½ inches in diameter.

Linear Ball Bearing

Thomson Industries, Inc., Manhasset, N. Y., announces the development of a "Ball Bushing" having a substantially greater load rating than previous units and suitable for use where shaft rigidity and load capacity are important. Designed primarily to provide anti-friction support to linear motions along 1½-inch diameter guide rods or reciprocating shafts, the bearing is said to afford extremely low friction and a close fit to the guide rod without binding and chatter. Precision alignment is maintained over long periods since the free rolling ball

Save time and money with these new side gripping self-locking jaw clamps

• J & S Jaw Clamps hold all sizes and shapes of work pieces tightly against face plates of machine tools. Clamp is self-locking and full surface of work ¾" high or over may be machined without interference, because the jaws grip the work-piece on the sides. These Clamps facilitate controlled centering adjustment—secondary operations are unnecessary—they eliminate different length studs and blockings — tested for two-ton down pressure. Send for details.



Also Manufacturers of Fluidmotion and Form-Master Wheel Dressers and Special Form-Grinding to Specifications

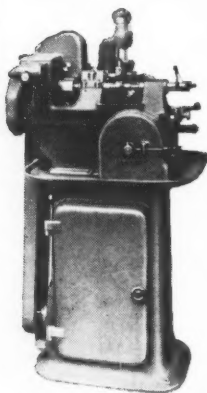


LAMBERT

Increase Gear Production!

LAMBERT M75 STEPS UP PRODUCTION 50%

Ideal for the manufacture of precision gears with diameters from .07874 to 3.46456 inches (2 to 88 MM).



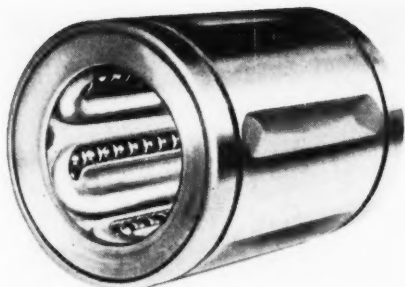
- **STRAIGHT TEETH GEARS**
- **HELICAL GEARS**
up to 18° R.H. or L.H.
- **WORM WHEELS**
(cut radially)
and with available special attachment
- **BEVEL GEARS,**
straight teeth

Automatic radial and longitudinal feed, combined in the M75, effect a shortened approach stroke . . . increasing productive capacity as much as 50 per cent!



Write for data on Model 75 and other Lambert gear hobbing machines.

LAMBERT DIVISION
HAUSER
MACHINE TOOL CORP.
MANHASSET, N.Y.



Thomson 1 1/2-Inch "Ball Bushing"

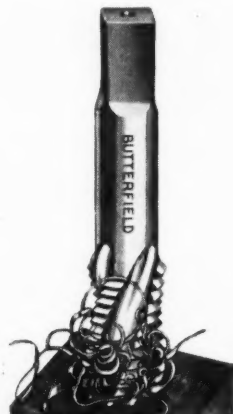
bearing action eliminates wear, the manufacturer claims.

The outside diameter of the bearing is 2.375 inches and the overall length is 3.00 inches.

Spiral Fluted Tap

Available in hand and machine screw types, a high speed steel, commercial ground tap with right-hand spiral flutes for cutting smooth, accurate threads in aluminum, magnesium, brass, copper, zinc, and similar materials is being marketed by the Union Twist Drill Co., Butterfield Division, Derby Line, Vt. According to the manufacturer, the tap is provided with the correct degree of spiral to cut freely while cleaning chips from the

Butterfield Spiral Fluted Tap



hole, thus preventing clogging and subsequent damage to either threaded parts or the tap.

In the hand type, the Butterfield Spiral Fluted Tap is available in diameters from $\frac{1}{4}$ to 1 inch and, in the machine screw type, in screw gauge numbers from 3 to 12.

Coil Weight Calculator

A coil weight calculator which is designed to permit the quick and easy calculation of the exact weight of steel coils is now being offered free by the F. J. Littell Machine Co., 4113 Ravenswood Ave., Chicago 13, Ill. The calculator consists of two dials which are first set together according to the inside and outside diameters of the coil whose weight is to be determined. The figure obtained is the pounds per inch of width of the coil. This weight figure is then set with the width of the stock to obtain the total weight of the coil.

On the back of the calculator is a handy sheet-gage table and a complete listing of all sizes of Littell reels. By using the calculator, the shopman can readily se-

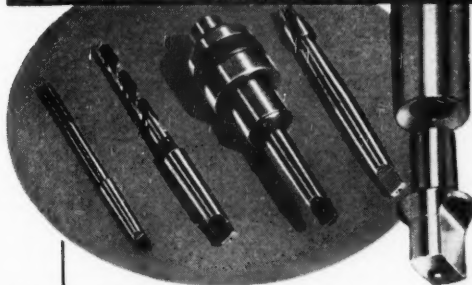
lect the correct size of reel required for any size or weight of coil. The calcula-



Littell Coil Weight Calculator

tor also provides a means of double checking coil weights shown on bills of lading.

OLD TOOLS MADE NEW with NU-TANGS



NO WELDING! NO SLEEVES!
NO SHORTENING! NO DISTORTION!
GUARANTEED STRONG AS NEW!

Send them to
us like this



We return them
like this



**at a FRACTION
of NEW TOOL
COST!**

Exclusive NU-TANG process † replaces twisted or broken tangs on any tool with a Morse taper (sizes 2 to 6). Any tool—drills, reamers, countersinks, cutters, drivers—repaired perfectly with brand new tangs. Amazingly low cost. Satisfaction guaranteed. NU-TANGS are used by leading industries. Send tools for prompt repairs—or write for prices and literature.

† Patent Pending

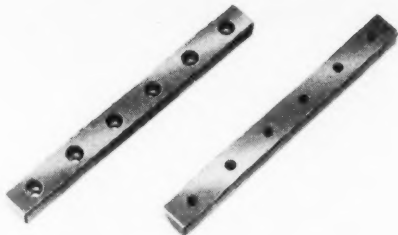
NU-TANGS INC. 1337 Bates Street
Cincinnati 25, Ohio



Aluminum-Bronze Wear Strip

An aluminum-bronze wear strip for use on boring bars and driving tools piloted in bushings is being offered by Scully-Jones & Co., 1909 S. Rockwell St., Chicago 8, Ill. Said to practically eliminate seizing and galling caused by high speeds, heavy loads, and adverse operating conditions, the strip is cast from Ampco Metal Grade 21 which has a low coefficient of friction and good heat conductivity.

The strip is available in 6-inch lengths and in 5 standard widths of $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$,



Scully-Jones Aluminum-Bronze Wear Strips

and 1 inch. All sizes are of the 6-hole type and are furnished complete with cap screws.

CAMS

Our ROWBOTTOM cam cutting facilities are at your disposal for your cam requirements.

Let us have your inquiries.

BLOOMFIELD TOOL CORP.

37 FARRAND ST.

BLOOMFIELD, N. J.

THE ERRINGTON ADJUSTABLE DRILLING HEAD

This versatile tool permits you to take advantage of a wide range of adjustment without overhang. ERRINGTON Adjustable Drilling Heads can also be supplied with three spindles for equal adjustment in line and three, four, five or six spindles for equal adjustment on bolt circles. Range from 0 to $1\frac{1}{2}$ " drills.

FEATURES: Fully geared. Needle bearings on all spindles in head. Ball thrust bearings throughout. Bronze bushed. Sand cast aluminum case. All parts fully enclosed for pressure lubrication and protection. Non-slip positive clamping on all adjusting members. Send blueprint, sketch or sample for quotation — no obligation.



Contracted

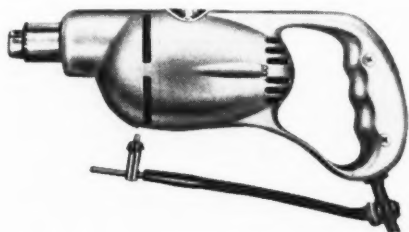
Established 1891

ERRINGTON Mechanical Laboratory, Inc.

Main Office and Plant:
STATEN ISLAND 4, NEW YORK

$\frac{1}{4}$ -Inch General Utility Drill

Cummins Portable Tools, 4740 N. Ravenswood Ave., Chicago 40, Ill., announces a $\frac{1}{4}$ -inch general utility drill



Cummins Model 150 General Utility Drill

with capacity of $\frac{1}{4}$ inch in metals. Features of the tool include a die-cast aluminum frame; natural grip handle; preci-

GEARS GOOD GEARS ONLY

All Kinds—Any Quantity

AT THE RIGHT PRICE

THE CINCINNATI GEAR CO.
Wooster Pike Cincinnati, Ohio

sion-cut gears; sturdy universal type motor for 115 volts, a.c. or d.c.; adequate ventilation; protected switch; extra long carbon brushes; smooth front housing; and 8-foot long rubber-covered cord with 2-prong rubber plug.

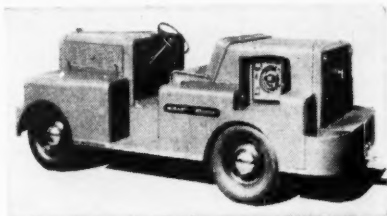
The drill is available in three models: Model 150 with Jacobs 1B geared chuck; Model 160 with Jacobs hex-key chuck; and Model 170 with keyless chuck.

Self-Propelled Arc Welder

Known as the "Weldmobile," a self-propelled arc welder especially designed for making quick and efficient welded repairs around large railroad yards, oil refineries, steel mills, and so on, is now being manufactured by the Hobart Brothers Co., Box 389, Troy, Ohio. Completely self-contained, the unit is available in two models: the GR-301-M with 300-ampere welder for light to heavy welding requirements and the GR-401-M with 400-ampere welder for medium to extra heavy welding requirements. Either model can be furnished with 1 or 3 kw. auxiliary power for supplying lights and universal power tools.

The Weldmobile is equipped to roll along to the job under its own power

and to make on-the-spot repairs with arc welding, oxyacetylene welding and cutting, and power tools. A universal coupler



Hobart "Weldmobile"

is provided on the rear of the unit to allow for the towing of additional equipment such as trailer mounted welders, air compressors, and so on.

Blind Thread Rivet

A "blind thread" rivet designed for heavy gauge sheet metal fastening jobs is announced by the Cherry Rivet Co., 231 Winston St., Los Angeles 14, Calif.

◆ BLACK DIAMOND ◆ PRECISION GRINDER for ALL SMALL DRILLS • Saves You 50% and More on Drill Grinding & Drilling Costs •



IF you use small gauge or fractional drills—singly or in gangs—by hundreds or thousands—this moderately priced machine—motor driven—will keep any quantity sharp and ready for any job.

Anyone can operate a Black Diamond. Even the most inexperienced can keep all drills sharp and true centered, with smooth lips ground to exactly the same length—at the proper angle and with correct clearance for fast, precision drilling.

Black Diamond Grinders cut 50% and more on drill grinding as well as drilling costs, sharpen without waste of expensive drill stock, reduce drill breakage and work spoilage to a minimum.

The built-in Diamond Dresser keeps the grinding wheel ever-sharp cutting and the Web Thinning Attachment cares for all types of notched points to perfection.

Write for New Bulletin

BLACK DIAMOND SAW & MACHINE WORKS, INC.
47 NORTH AVENUE NATICK, MASSACHUSETTS

STEEL
Stanho
PRODUCTS

PRECISION
 ACCURACY

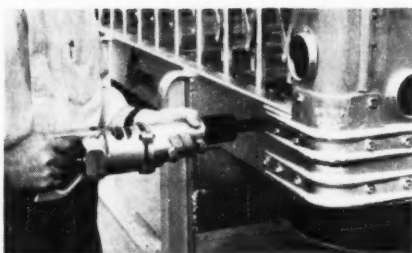
**FLAT
 BOTTOM**

WOODRUFF KEYS

Machine Keys • Machine Rock
 Taper Pins • Straight Pins
 Cotter Pins and Other
 "Stanho" Steel Products.

M-1

STANDARD
HORSE NAIL CORP.
 Since 1872
 NEW BRIGHTON, PA.



Heavy Gauge Sheet Metal being Riveted with Cherry "Blind Thread" Rivets Installed by Automatic Screw Driver with Adapter

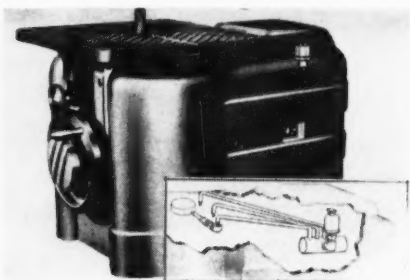
The rivet is available in $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{3}{4}$ -inch diameters and in grip lengths from $\frac{1}{8}$ to $\frac{3}{4}$ inch.

The rivet is made of steel and has a protruding type head. It can be installed from one side of the job by a single operator. The tool used is an automatic screw driver fitted with an adapter which has interchangeable tips that accommodate the three diameters in which the rivet is available.

Oiling System for Profile Grinder

The Boyar-Schultz Corp., 2120 Walnut St., Chicago 12, Ill., has announced that its No. 1 bench model profile grinder now incorporates an improved oiling system which is designed to keep the spindle thoroughly lubricated, thereby increasing its life of accurate grinding. As shown in the accompanying illustration, the system consists of a reservoir with three distributing lines—one running to the spindle and one each to the ways on which the oscillating mechanism operates.

Oiling System for Boyar-Schultz No. 1 Bench Model Profile Grinder



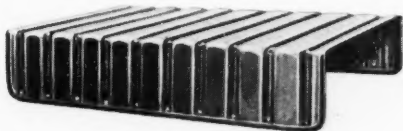
GAMMONS
REAMERS

Manufacturers of
 The Gammons Helical Taper Pin Reamer
 The Gammons Helical Chucking Reamer
 The Gammons Helical Die Makers Reamer
 The Gammons Duplex Taper Pin Reamer
Special reaming problems invited
Send for Catalog

THE GAMMONS-HOAGLUND CO.
 MANCHESTER CONNECTICUT

Corrugated Steel Platform

Designed for use with any type of lift truck, an all-steel platform which is said

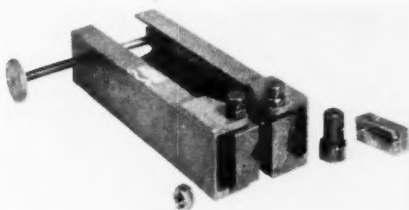


Palmer-Shile Corrugated Steel Platform

to withstand unusual load strain is announced by the Palmer-Shile Co., 16022 Fullerton Ave., Detroit 27, Mich. The platform is cold pressed from a sheet of formed corrugated heavy gauge steel and can be equipped with knee braces and bumper channel runners. The platform can be built to any desired dimensions and with any underneath clearance required.

Remnant Vise

Designed to fit between the jaws of a cutoff saw vise to hold small round or flat pieces, even 1 inch long, a "remnant" vise known as the "Visette" is being manufactured by the Oberwegner Machine Co., 5911 Woodlawn Ave., Los Angeles 3, Calif. The vise includes small steel jaws which are adjustable to any



Oberwegner "Visette"

angle, and is claimed to be of particular use to jig and fixture makers.

REDUCE FINISHING COSTS
FROM
30% to 90%

SCHAUER
speed lathes

POLISH • LAP
BURR • FINISH

Plants using these low-cost, high-production machines, say: "Polishing time cut in half!" "Smoother, more uniform finish!" "Substantial savings effected in de-burring operations." In your plant, where secondary finishing operations are required - save with Schauer-A type for every purpose!

Write Today for Illustrated Catalog 480

SCHAUER MANUFACTURING CORP.

• ORIGINATORS OF TODAY'S SPEED LATHES

2060 READING ROAD

CINCINNATI 2, OHIO, U. S. A.



Indicating Snap Gage

An all-purpose indicating snap gage which is designed to provide the machine tool operator with quick, positive information on the dimension of the work being machined is announced by the Federal Products Corp., 1112-F Eddy St., Providence 1, R. I. Designated as the Model 1000, the gage includes a dial indicator having a cushioned movement, and can be faced in any position for machine or bench use. The indicator is located at the top of the gage for easy reading and is protected from abusive treatment by a guard.



Federal Model 1000 Dial Indicator Snap Gage

ADVANCE CLAMPS

Cut Set-Up Time 75 %

on

MILLING MACHINES

THE ONLY T-SLOT CLAMP

For use on all machines with T-slots.

Manufactured and sold by

ADVANCE MACHINE WORKS

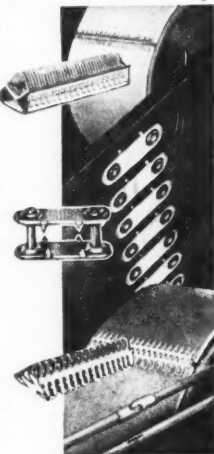
FORT WAYNE 7, INDIANA

ARMSTRONG - BRAY

WIREGRIP Belt Hooks come with extra (patented) blue aligning cards—that assure perfect alignment of hooks—less hook loss and a better job when applied. 6 sizes.

PLATEGRIP Fasteners for ... Conveyor Belts. Make strong dust-tight joints in belts of any width. Spread tension uniformly. Allow natural troughing of belt. Operate smoothly over flat, crowned or take-up pulleys. Sizes for belts from 1/4" to 1 1/2" thick. Easily applied.

STEELGRIP Flexible Lacing, applied with a hammer, clinches over and protects end of belt. Makes strong, flexible joints. Boxed with 2-piece hinged rocker pins or in long lengths.



ARMSTRONG-BRAY & CO.

"The Belt Lacing People"

5346 Northwest Hwy.

Chicago, Ill.

The contact point of the gage is spring mounted and guarded from sidewise blows. The spring-loaded point also supports the weight of the hand and gage. The upper and lower contacts are tungsten carbide tipped.

Protected from dirt and coolant, the gage is available in five sizes covering all dimensions from 0 to 6 inches. The two small sizes have cast iron frames, and the three large sizes have aluminum frames with insulated grips.

Stop Collets and Stops

Hardinge Bros., Inc., Elmira, N. Y., announces a series of standardized stop collets and stops for Brown & Sharpe automatics and wire feed machines. The stops are available in solid and spring ejector

Granite Surface Plates

Durable • Accurate • Economical

The inherent hardness and durability of granite, accurately finished to a guaranteed tolerance of .00005", provide the most efficient and economical surface plates for precision measurement operations. Sizes up to 8' x 16'.

★ Non-Magnetic ★ Can Not Warp

★ Corrosion-proof

Write for Free Trial Offer

THE HERMAN STONE COMPANY

324 Harries Bldg. • Dayton 2, Ohio

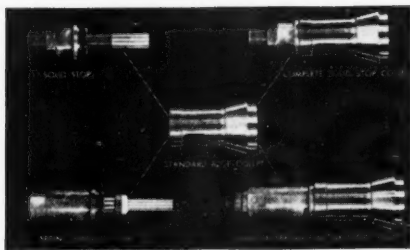


Illustration Showing Interchangeability of Hardinge Standardized Collect Stops and the Two Combinations Obtained with One Standard Stop Collet

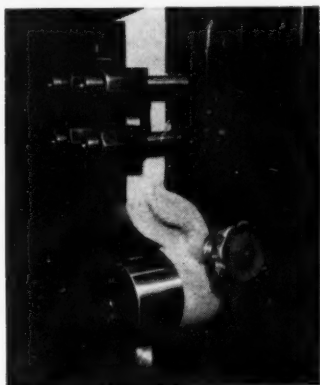
types and are threaded for direct application to the standard stop collets.

Heavy Duty Radius Tool

C. B. Teeter, 4470 Oakenwald Ave., Chicago 15, Ill., has increased its Monarch "Shaplane" line of radius tools to include a heavy duty model which is designed to cut a 2½ to 6-inch radius using a ¾ x 1-inch tool bit. The revolving tool-head is over 4 inches in diameter and the

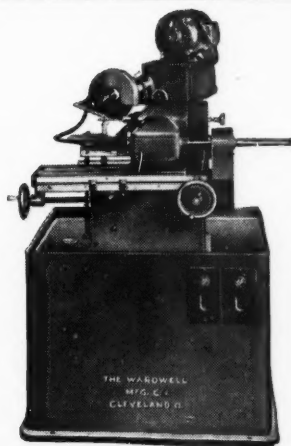
shank is 1 inch wide x 2¼ inches thick x 8½ inches long.

Made of alloy steel, the tool can be



Monarch "Shaplane" Heavy Duty Radius Tool

quickly adapted to large shapers, large lathes, and for many operations on boring mills. The tool weighs 37 lb. and is supplied in a wooden case.



**THE WARDWELL
MANUFACTURING CO.**
3166 FULTON ROAD
CLEVELAND 9, OHIO

CARBIDE FLUTING COSTS LESS WITH

WARDWELL 90FS

Automatic Universal Flute Grinder

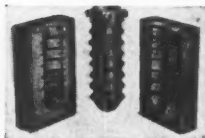
Indexes automatically. Grinds and sharpens taps, reamers, milling cutters, end mills. Greater speed! Greater precision! Grind spiral flutes from solid more economically with Wardwell 90FS. Grinds spiral angles up to 45° and spiral leads as short as $\frac{5}{16}$ " to one turn. Sharpens saws up to 12" in diameter and in gangs up to 7¼" long.

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Dies, Chucks, Patterns, Tube Bends Make them faster . . .

and better . . .

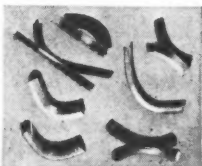
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Chuck Jaws made of Cerromatrix



Duplicate of Master Pattern made with Cerrobise



Extrusions and tubes bent with Cerrobend

☐ Reduce tool room labor cost. Make chuck jaws for holding irregular parts in a fraction of the time by the Cerromatrix method.

☐ Speed up production of accurate duplicate patterns for match plates with non-shrinking Cerrobise.

☐ This wall tubing and extruded shapes are readily bent to small radii without buckling, flattening or wrinkling where Cerrobend (melting point 158° F.) is used as filler. Readily melts out cleanly in boiling water.

X the operation in which you are interested, and clip this ad to your letterhead. Literature will be forwarded without obligation.



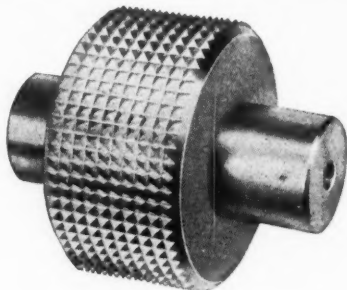
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COPPER CORPORATION

Dept. 10
40 Wall Street, New York 5, N. Y.

Knurling Wheel

Kennametal Inc., Latrobe, Pa., has developed a knurling wheel of solid Kennametal for roughing up the surfaces of



Kennametal Knurling Wheel

mill rolls. The wheel is supported on a solid Kennametal pin held in the usual fixture, and is available in sizes and designs to meet user requirements.

Face Milling Cutter

The Ingersoll Milling Machine Co., Rockford, Ill., has developed a face milling cutter with carbide-tipped blades for the milling of cast iron at high feed rates. The cutter embodies the fundamental "Shear Clear" principle of cutting on the bevel portion of the blades, which are set into the housing at negative radial and positive axial rake angles. Suitable for



Ingersoll "Shear Clear" Milling Cutters

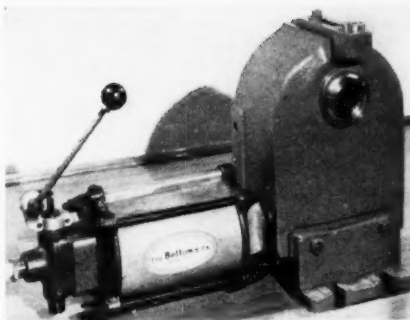
feed rates up to 75 inches per minute, the cutter features very fine blade spacing (38 blades in a 10-inch cutter).

Collet Chuck

A heavy duty collet chuck designated as the BZC-10 has been added to the line of "Controlled-Air-Power" devices marketed by The Bellows Co., Dept. MMS, 222 W. Market St., Akron 9, Ohio. The chuck is powered by an air motor which is said to develop a thrust 10 times the operating air line pressure. The holding power of the chuck is claimed to be sufficient to withstand severe types of drilling, tapping, and milling without the danger of the workpiece slipping or twisting in the collet.

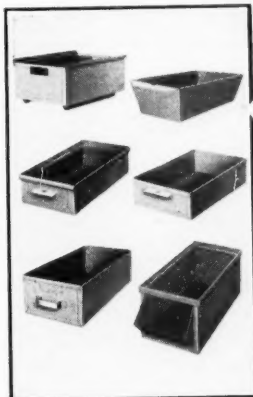
The BZC-10 is designed to accommodate most standard collets with stock clearance up to 1 1/4 inches. With an adapter unit (furnished on order) the chuck is said to accommodate practically any standard externally threaded draw-type collet. Variations in diameters of workpieces or stock can be compensated for, with the collet permitting the passing of stock up to a maximum size limit of 0.020 inch. An adjustable stop is available as optional equipment.

A unique feature of the chuck is the "dead man" safety control which is so designed that in the event of air pressure failure, work will still be held firmly and



Bellows BZC-10 Collet Chuck

air pressure must be applied before the work can be released. The chuck may be mounted in any desired position, with ample chip clearance provided at the base. Designed to allow collets to be removed or changed without taking the chuck from the table, the BZC-10 is available either with a manually operated valve or with a Bellows electrically controlled air power valve.



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18" x 12" x 6". 18 Ga. \$1.38
with Drop Handles

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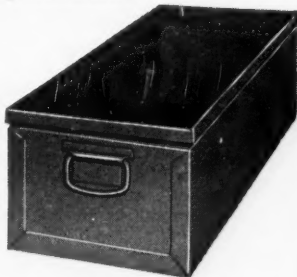
16 x 10 x 6 18 Ga.

16 x 10 x 6 16 Ga.

18 x 12 x 6 16 Ga.

18 x 12 x 8 16 Ga.

MADE IN OTHER SIZES



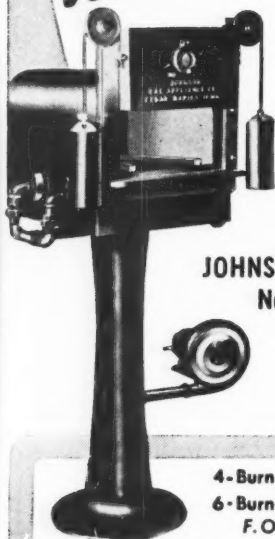
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4-Burner \$295

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at LOW COST**

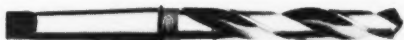
Quick Acting JOHNSON No. 130A is available in two temperature ranges. 4-Burner unit is for steels requiring 1400—2350° F., and 6-Burner unit for 1800—2400° F. Powerful, efficient burners fire under hearth assuring fast, uniform heat. Save time and gas. Easily regulated. Firebox 7x13x16½ lined with high temperature insulating refractory. Complete, ready for action with Carbofrax Hearth, G. E. Motor and Johnson Blower. Order Today!

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Reamers**

High speed twist drills and reamers have been added to the line of taps, abrasive wheels, grinders, and accessories

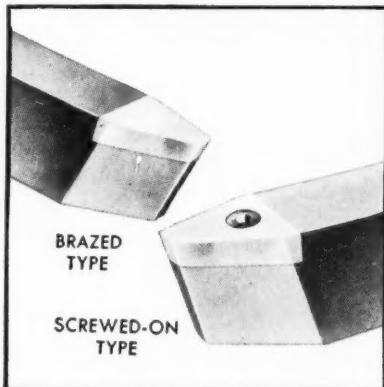


Besly High Speed Twist Drill and Reamer

manufactured by Chas. H. Besly & Co., 118-124 N. Clinton St., Chicago 6, Ill. The drills and reamers are available in a wide variety of styles and sizes.

Pulley-Grooving Tool

Kennametal Inc., Latrobe, Pa., is producing a tool for machining grooves in pulleys to the dimensions recently approved by the Multiple "V" Belt Drive & Mechanical Power Transmission Association. The tool is supplied in two types,



Kennametal Pulley-Grooving Tools

one having a brazed-on Kennametal blank and the other having the Kennametal blank mechanically held by means of a socket head cap screw. The tool is available in styles suitable for cutting grooves for V-belts A through E.

New Books

The Supervisor's Management Guide. Published by American Management Association, 330 W. 42nd St., New York 18, N. Y. 190 pages. Ring binding, flexible leatherette covers. Price to A.M.A. members, \$3.00; non-members, \$3.50.

Third in a series of handbooks analyzing improved management practices, this guide includes eight sections and twenty chapters prepared by seventeen operating executives and specialists to assist supervisors, foremen, and other operating executives in industry to apply new developments in management methods for improving human relations in business. The book presents case histories and descriptions of successful supervisory programs and techniques developed by companies in all types of industries, and is intended for use as a desk manual for operating management, for individual reading by executives, and for supervisory conference training through chapter-by-chapter discussion.

Establishment and Maintenance of the Electrical Units (Circular C475). By F. B. Silsbee. Published by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 38 pages. 23 illustrations. Price, 25 cents.

Circular C475 is a description of the new system of electrical measurement using "absolute" units adopted by

the International Conference of Weights and Measures and officially instituted January 1, 1949. The purpose of this booklet is to record an account of the working of the international system of electrical units, with particular reference to the maintenance of the international units in the 37 years preceding the adoption of the new units; to point out the trends of development that made them obsolete; and to record the official steps by which they were superseded.

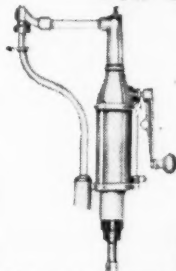
Also described are the methods used in the measurements that now form the basis for the new absolute units, in which

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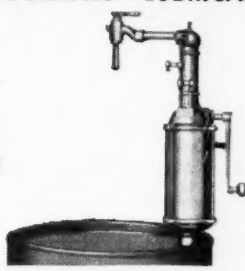
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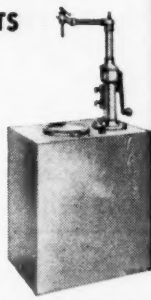
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all certifications for standards and instruments are now given by the National Bureau of Standards. In addition, United States laws, important conferences and resolutions pertaining to the adoption of the new units are reproduced in the appendices of the booklet.

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New Shop Literature

The publications listed in this section may be obtained free upon written request on company letterhead to the manufacturers concerned. Your courtesy in mentioning MODERN MACHINE SHOP when requesting copies of these publications will be sincerely appreciated by the manufacturer and the publisher of this magazine.

Price List on Standard Taps. As a time-saver for the manufacturer as well as the distributor, the Threadwell Tap & Die Co., Greenfield, Mass., has published a net consumer price list on standard carbon and high speed steel taps.

Wrenches with $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{1}{2}$ -inch driver openings for internal wrenching operations are described, illustrated, and listed as to dimensions and prices in a bulletin issued by L. C. Domack, 1149 Milwaukee Ave., Chicago 22, Illinois.

Cold Header for upsetting and forging bolts, screws, and rivet heads is fully illustrated and described in a four-page two-color circular prepared by Joseph Behr & Sons, Inc., 1208 Seminary St., Rockford, Illinois.

Industrial Air Equipment. Air-Mite, 2651 W. Lake St., Chicago 12, Ill., has published a 24-page catalog (No. 49) illustrating and describing a line of industrial air equipment, including arbor presses, parallel thrust cylinders, vertical thrust cylinders, vertical face cylinders, clevis mounted cylinders, valves, filters, regulators, oilers, and air line fittings.

INSTANT ACTION RAPIDSET
 by HARTMAN



All Purpose Tool Room and Machine Shop Vises.
The JAWSET
 Adjustable Pressure Production Vise.
 For Information Write
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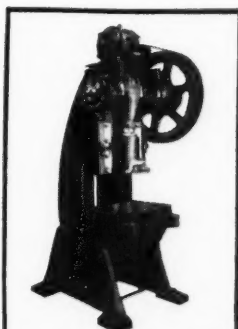


Floor Patching Material. A four-page two-color illustrated folder issued by the Flexrock Co., 3615 Filbert St., Philadelphia 4, Pa., describes a patching material for concrete floors, known as "Instant-Use," which can be applied in a few minutes and put into full unrestricted use immediately.

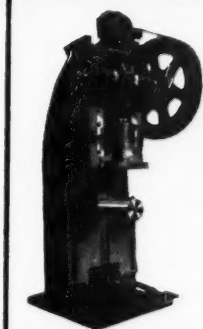
Band Knives for the fast, precision cutting of soft and fibrous materials are shown, described, and listed as to sizes and prices in a four-page two-color bulletin released by The L. S. Starrett Co., Athol, Massachusetts.

In-Line Mounting Master Valves and Pilot Valves are illustrated and described in an eight-page bulletin (No. 302) issued by the Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich. Typical installation diagrams are included.

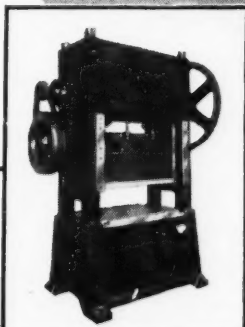
Flexible Shaft Machine. Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn., has released a four-page two-color circular (No. 621) illustrating and describing its "Series M" Kellerflex Multiple Speed Flexible Shaft Machines for a wide variety of operations.



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P-6

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THOMAS
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Industrial Vacuum Cleaners for various plant maintenance purposes are described and illustrated in a four-page folder distributed by the Breuer Electric Mfg. Co., 5100 Ravenswood Ave., Chicago 40, Illinois.

Gas Cutting Machines. The Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y., has published a 12-page descriptive folder (Form No. ADC 628C) on its pantograph type gas cutting machines, the Oxygraph and the Travograph.

Central Air Conditioning Equipment for comfort cooling and industrial applications is fully illustrated and described in a 16-page two-color bulletin (No. 3158B) now being issued by the Buffalo Forge Co., 388 Broadway, Buffalo, N. Y. The bulletin covers various types of units and includes charts, specifications, and maintenance instructions.

"The Toolmaker's Time is Valuable—Why Waste It?" is the title of a six-page illustrated catalog (No. 19) published by

the Northwestern Tool & Engineering Co., 119 Hollister Ave., Dayton 3, Ohio, which presents complete tabular data on quarter turn screws, shoulder screws, screw and press-fit type jig feet, flanged nuts, cut thread studs, T-nuts, coupling nuts, step locks, hand knobs knurled head screws, T-nut and stud sets, punch press sets, and step block sets.

Automatic Reversing Vane Pumps, available in stripped models without housings, stripped models with housings, and complete models, recommended for use in connection with Diesel engines, compressors, blowers, machine tools, speed reduction units, and so on, are fully covered as to construction features, dimensions, operating performance, and installation in an eight-page two-color illustrated bulletin published by the Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

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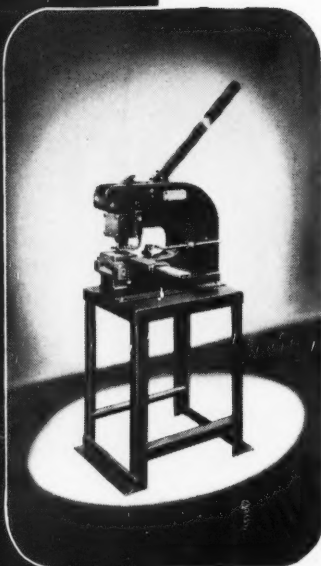
1/2" thru 3/16" or 1-1/2" thru
1/8" mild steel — 7-1/2 tons

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7", 10", 18", 24"

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Rectifiers equipped with electronic time delay switches and specifically designed for industrial use in connection with magnetic chucks, magnetic lifts, direct current motors, and so on, are shown, described, and tabulated as to standard stock sizes in a four-page two-color bulletin (No. R62) issued by the Electro-Matic Products Co., 2237 N. Knox Ave., Chicago 39, Illinois.

Dry Cyaniding. A four-page folder (No. SC-145) illustrating and discussing the application of Dry (gas) Cyaniding, a process for case hardening steel in an atmosphere containing a carburizing gas with ammonia added in controlled amounts, to the operation of continuous and batch-type industrial furnaces has been released by the Surface Combustion Corp., Toledo 1, Ohio.

Cutting-Off Machines, both manually operated and automatic types, for cutting off tubing, pipe, and bar stock are shown and described in an eight-page bulletin prepared by the Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. Also shown and described is a machine designed for cropping or trimming and burring or chamfering both the inside and outside of the ends of seamless tubing after drawing.

Motorized Centers, a versatile grinding attachment for use on surface grinders, jig borers, jig grinders, drill presses, and light milling machines, is described in a four-page catalog released by the Moore Special Tool Co., Inc., 730 Union Ave., Bridgeport 7, Conn. Twenty action photographs show many uses for the attachment, including taper grinding, contour grinding, and faceplate work.

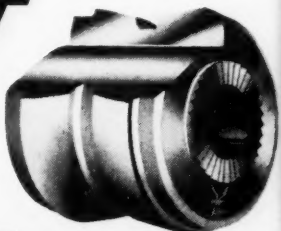
Rotating and Straight Shelving. A four-page two-color folder issued by the Frick-Gallagher Mfg. Co., 405 Shubert Bldg., Philadelphia 2, Pa., discusses the savings obtained from efficient shelving layout and illustrates and describes various types of Rotabin rotating units for use singly or in combination with straight shelving or counters. Straight steel shelving for various industrial needs is also covered.

Falcon

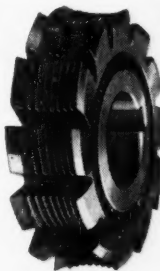
**MAKES NO COMPROMISE
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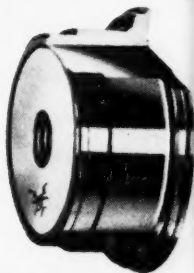
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SPECIAL TOOLS
MILLING CUTTERS
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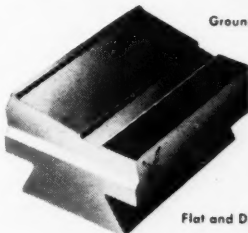
Ground Circular Form Tools



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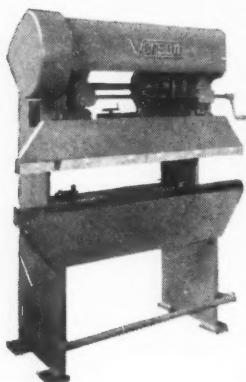
Heavy Steel Plate Stock, available in thicknesses from $\frac{1}{2}$ to 15 inches, is described and listed as to specifications in a four-page two-color bulletin distributed by the By-Products Steel Co., 183 Strode Ave., Coatesville, Pennsylvania.

Fiber Discs. Behr-Manning, Troy, N. Y., has prepared an eight-page two-color folder describing and illustrating in an interesting manner the features of its Speed-Wet Metalite Fiber Discs for disc grinding operations.

Milling Cutter Data. The Barber-Colman Co., 4536 Loomis St., Rockford, Ill., has available a ring binder containing performance data bulletins on a wide variety of milling cutters and other cutting tools, including plain milling cutters, half-side milling cutters, staggered-tooth side milling cutters, interlocking side mills, roller chain sprocket cutters, full side milling cutters, profile ground stepped straddle mills, unground form relieved cutters, spiral profile ground cutters, unground multiple thread mills, unground straight gashed formed cutters, standard Woodruff keyseat cutters, formed

milling cutters, special milling cutters, profile type formed cutters, multiple tooth rack cutters, thread milling cutters, interlocking and side milling cutters, shank-type thread mills, formed relieved cutters, shell end mills, cam relieved formed cutters, inserted-blade shell reamers, standard metalslitting saws, inserted-blade shell line reamers, multiple boring tools, double-end reamers, and so on. Also provided are data bulletins on the automatic sharpening of thread milling cutters; sharpening of hobs, cutters, and reamers; uses and advantages of climb milling; selection of the proper cutter speeds and feeds; method of checking the exact amount of clearance on resharpened milling cutters; and how to select the proper cutting oils for milling operations. Additional data sheets will be issued from time to time and will be sent to persons having the binder for insertion in same.

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Shops that are wasting manpower with hand brakes or tying up big machines with small odd jobs have the answer to their problems in the new Verson 16-48 Press Brake.

Compact and low in cost, the 16-48 brings the advantages of power operation and big brake design to smaller shops. Bed and ram length is 48". Capacity ranges from a 48" length of 16 ga. steel to a 24" length of 10 ga. steel. Allsteel construction assures perfect alignment and maximum rigidity. Write for a copy of Bulletin 16-48A; it gives complete design details, specifications and capacities.

VERSON ALLSTEEL PRESS CO.

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That's just one reason advertisers get such profitable results from MODERN MACHINE SHOP. **RESULTS TELL THE STORY.** Gardner Publications, Inc., Cincinnati 2, Ohio.



Hydraulic Hand Lift Truck, known as the "Red Giant" and intended for use with single or double faced pallets, is illustrated and described in Bulletin 171 available from the Revolver Co., North Bergen, New Jersey.

Ground Flat Tool Steel. A catalog containing size and heat-treating information on water quenched, oil quenched, and air quenched ground flat tool steel has been published by the Marshall Steel Co., Box 108-B, McCook, Illinois.

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Thread Miller. Wickes Bros., Saginaw, Mich., has available an eight-page two-color bulletin (No. TM-300) which provides illustrated, descriptive, and tabular information on the Wickes Model 30 Smalley-General Thread Miller which employs a multiple ring tooth cutter for milling straight and tapered, inside and outside, right and left-hand threads.

Rotary Gear Finishers. Bulletin No. 873-49 describing a line of completely automatic (except for loading) crossed-axis rotary gear shavers designed for the high production finishing of large gears is available from the Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

Portable Metal-Cutting Band Saw with capacity for rounds up to 6 inches and flats up to 6 x 10 inches is illustrated, described, and listed as to specifications in a bulletin available from the Machine Tool Division, Kalamazoo Tank & Silo Co., Kalamazoo 16, Michigan.

Chucks and Segments for fast, efficient surface grinding are described, illustrated, and covered as to performance, prices, sizes, and so on, in a four-page two-color folder issued by The Sterling Grinding Wheel Division, The Cleveland Quarries Co., Tiffin, Ohio.

Corrosion-Resisting Plug Valves. Bulletins 637 and 638 illustrating and describing top lubricated and bottom lubricated plug valves, respectively, for heavy duty corrosion service are available from the Duriron Co., Inc., Dayton 1, Ohio.

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Drafting Machines. A 20-page profusely illustrated bulletin (A-1055) describing all models of the Bruning Drafter for engineers, draftsmen, designers, architects, surveyors, and so on, is being offered by the Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill. Included are detailed drawings of 38 standard and special scales available for use with the drafter.

Precision Automatic Tapping Unit. The Precision Thread Engineering Co., 2540 Park Ave., Detroit 1, Mich., has available a two-color bulletin which illustrates and describes a precision automatic tapping unit that can be used for single or multiple operation in any plane or at any angle to operate simultaneously, in sequence, or in conjunction with other equipment from remote controls.

Relays. A colorful catalog (No. D-20A) distributed by the Ward Leonard Electric Co., Electronic Distributor Division, 53 W. Jackson Blvd., Chicago 4, Ill., illustrates and describes a line of relays for industrial and general purpose use.

Insert Chaser Die Head for cutting high quality taper pipe threads is described and illustrated in a four-page two-color bulletin (No. 16) published by The Eastern Machine Screw Corp., New Haven 6, Connecticut.

Ball and Roller Bearings. The Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill., has completed a 112-page detailed catalog and engineering data book (No. 2550) covering the company's complete line of ball and roller bearings. Details on construction features, prices, weights, load ratings, and all necessary dimensions of the various standard models of bearings are included.

Abrasive Segments. A four-page catalog bulletin (Form No. ESA-188) issued by the Simonds Abrasive Co., Philadelphia 37, Pa., explains how abrasive segments are used, their advantages, and discusses abrasives and bonds employed. Included are grain and grade recommendations of abrasive segments for both surface grinding and machine knife grinding operations.

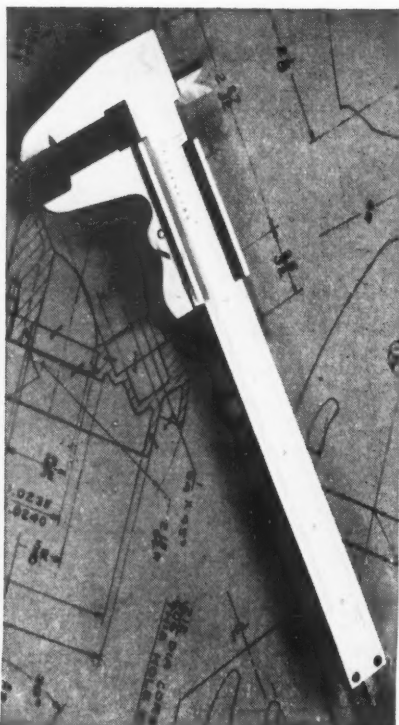
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Standard Tools and Blanks. Complete ordering information, prices, and discounts on all standard tools, blanks, insert tools, and diamond products marketed by the Carboloy Co., Inc., 11143 E. 8 Mile Rd., Detroit 32, Mich., are contained in Supplement No. 10 to Carboloy's General Tool Catalog.

Cable Cutter for use in cutting steel, copper or aluminum wire rope, heavy electrical wire, armored cable, steel reinforced rubber hose, and other materials is illustrated, described, and listed as to specifications in a bulletin issued by the Beverly Shear Mfg. Co., 3000 W. 111th St., Chicago 43, Illinois.

Drill Rod Rack, Pullers, and Oilers. The Acro Metal Stamping Co., 332 E. Reservoir Ave., Milwaukee 12, Wis., has published a four-page two-color catalog which illustrates and describes several of its various products, including a drill rod rack, die set pullers, leader pin oilers, and automatic lubricators for application on conveyor systems and similar equipment.

Precision Aligning Level. The Bullard Co., Bridgeport 2, Conn., has published a bulletin illustrating and describing the Bullard-Universal Precision Aligning Level which is available in two sizes (15 and 27 inches) for leveling all types of machines.

Boring and Threading Tool Holders with vertical adjustment for holding Bokum boring and internal threading tools in lathes are described and illustrated in a four-page two-color folder published by the Bokum Tool Co., 14775 Wildemere Ave., Detroit 21, Michigan.

Heavy Duty Presses. Catalog information and specifications on a complete line of heavy duty Autofeed presses available in capacities from 50 to 800 tons for high production stamping operations of all types are contained in a 16-page booklet offered by Danly Machine Specialties, Inc., 2100 S. 52nd Ave., Chicago 50, Ill. Detailed data on exclusive mechanical features of the presses are included.

Free-Machining Steel. A two-color illustrated bulletin now being distributed by Joseph T. Ryerson & Son, Inc., P. O. Box 9000-A, Chicago 80, Ill., contains detailed information on "Ledloy" Screw Steel, a lead bearing, open hearth, free-machining steel.

"Flexibility of Sheet Metal Operations" is the title of an eight-page reprint now being distributed by The Hydraulic Press Mfg. Co., 1048 Marion Rd., Mt. Gilead, Ohio, which explains how to handle the short-run production of metal-working parts so that it can be profitably "geared" to mass production.

Converters, Motor-Generators, and High Frequency Generators for large industrial plants, as well as laboratory use, are described and illustrated in a four-page catalog sheet (Form 549-MG) issued by the Kato Engineering Co., 1415 First Ave., Mankato, Minnesota.

Hand Chain Hoist, available in $\frac{1}{2}$ and 1-ton capacities, is fully illustrated, described, and covered as to dimensions in a four-page two-color bulletin (No. P-5) distributed by The Harrington Co., 17th & Callowhill Sts., Philadelphia 30, Pennsylvania.

Fan-Cooled Worm-Gear Speed Reducers. The Cleveland Worm & Gear Co., 3293 E. 80th St., Cleveland 4, Ohio, is distributing an eight-page two-color bulletin depicting and explaining installations of its "Speedaire" Fan-Cooled Worm-Gear Speed Reducers in which savings in space, weight, and money were effected.

Welding Products. The American Brake Shoe Co., 230 Park Ave., New York 17, N. Y., is distributing a four-page bulletin (No. CC-3) which lists a complete line of hard-facing rods and electrodes and indicates the type of service for which each is designed. Metallurgical and physical descriptions of each rod are so arranged as to simplify selection by the user of the correct rod for the job at hand.

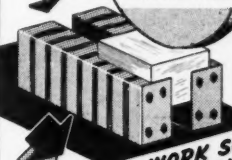
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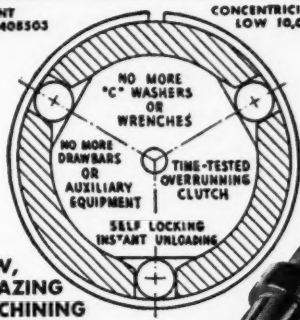
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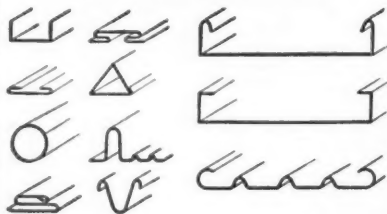
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Non-Rotating Double-Acting Air Cylinders are featured in a 12-page illustrated and descriptive bulletin (No. PD-120) issued by The Bellows Co., Dept. MMS, 222 W. Market St., Akron, Ohio, which provides complete data, including dimensional drawings, on all of the different types of mounts and different sizes.

"This Abrasive Can Really Cut Grinding Costs" is the title of a six-page bulletin issued by the Norton Co., Worcester 6, Mass., which explains the advantages of using Norton 32 Alundum Abrasive in performing surface, internal, tool, and cylindrical grinding operations.

Cutting Tools. Plew Tool & Metal Heat Treat, South Line St., Columbia City, Ind., has issued a six-page two-color circular, presenting illustrations, descriptions, dimensions, and prices of its "Lucky 13" series of cutting tools which comprises tool bits and cutoff blades that are claimed to have a hardness of Rockwell C 66-68 and a tensile strength of over 300,000 lb. per square inch.

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"Controlled-Air-Power" Machine Tool Power Feeds are illustrated and described in a 16-page three-color bulletin (No. DF-105R) distributed by The Bellows Co., Dept. MMS, Akron 9, Ohio. Actual installations of the power feeds are also shown and explained.

Flexible Chain Couplings. The Morse Chain Co., 7601 Central Ave., Detroit 8, Mich., is offering a 16-page catalog (No. C45-49) on roller chain stock couplings; silent chain stock couplings; heavy duty made-to-order silent chain couplings; and steel and plastic covers for the two types of stock couplings.

Heavy Duty Electrode Holder which is claimed to remain cool using electrodes up to $\frac{3}{8}$ inch at 600 to 700 amperes under continuous duty cycle is illustrated and described in a two-color bulletin (No. 749-S) available from Martin Wells, Inc., 5886 Compton Ave., Los Angeles 1, California.

Vibration Insulators. A 24-page profusely illustrated catalog presenting condensed and simplified data on a complete line of vibration insulators for various types of machinery has been released by Finn & Co., 2850 8th Ave., New York 30, New York.

"How to Reduce Abrasive Wear With Thermalloy HC-250," a six-page two-color folder released by the Electro-Alloys Division, American Brake Shoe Co., Elyria, Ohio, describes the physical properties of this unusually abrasive resistant material and lists many uses and advantages.

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Dry Lubricant and Anti-Seizing Compound, known as "Molykote" and particularly recommended for extreme bearing pressure applications and other uses where the danger of scoring, galling, or seizing exists, is discussed in a four-page two-color bulletin (No. 52) distributed by The Alpha Corp., Greenwich, Connecticut.

"How Tool Costs Were Cut 12 Ways in 20 Plants with McCaskey Tool Crib Control" is the title of a 12-page booklet distributed by The McCaskey Register Co., Industrial Div., 101 W. 31st St., New York 1, N. Y. Based entirely on written reports of savings from a score of representative plants, condensed for quick reading, the booklet is illustrated with amusing and suggestive cartoons.

Plastic Brush Coating, known as "Tread-Sure" and designed to produce an anti-skid surface on wood, concrete, or steel deck flooring, is fully described in a four-page two-color folder distributed by the A. C. Horn Co., Inc., 10th St. & 44th Ave., Long Island City 1, New York.

"Efficiency in Die-Set Handling" is the title of an eight-page two-color brochure distributed by Bowman Products, Inc., University & Cromwell Aves., St. Paul 4, Minn., which illustrates and describes in detail the Bowman Die-Processor for all die shop operations.

Mounting Bolts. A line of T-bolts, bolster bolts, nuts, and washers made to J.I.C. pressroom standards in a wide range of sizes is listed as to specifications, and so on, in a circular issued by the West Point Mfg. Co., 19625 Merriman Court, Farmington, Michigan.

Variable Speed Control Unit, designed to deliver infinitely variable speed to any driven machine with speed ratios from $1\frac{1}{4}$ to $2\frac{3}{4}:1$, is covered as to features, ratings, dimensions, prices, and so on, in an eight-page two-color illustrated bulletin (VN-4912) published by the Reeves Pulley Co., Columbus, Indiana.

Vibration Absorbing Felt for machine mountings is described in a 20-page booklet published by the Western Felt Co., 4029 Ogden Ave., Chicago 23, Ill., which presents typical examples of equipment isolated with the material.

"Meehanite Quality Control Assures Uniform Dependability" is the title of a four-page bulletin (No. 32) issued by the Meehanite Metal Corp., Pershing Square Bldg., New Rochelle, N. Y., which provides a complete tabular summary of the engineering properties of the various types of Meehanite castings available to industry.

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Strip and Spring Steels. Designed to provide complete specifications on all Precision Brand steel products, a 98-page pocket-size catalog issued by Precision Steel Warehouse, Inc., 4409 W. Kinzie St., Chicago 24, Ill., is also intended as a handy reference guide for steel purchasing agents, production executives, foremen, and engineers. Included in the catalog are A.I.S.I. and S.A.E. steel analyses, a glossary of trade terms, decimal equivalent tables, comparative tables on Rockwell and Brinell hardness, weight tables on both coil steel and cold rolled strip steel, pressure charts, and many other aids. One section of the catalog is devoted to steels which include strip, spring, stainless, tempered spring, and brass and bronze strip. Another section covers toolroom specialties such as shim stock, music wire, ground flat stock, feeler gauge and drill rod.

Standardized Materials Handling Equipment. The Market Forge Co., Everett, Mass., has prepared a 32-page catalog (No. 1201MH) which contains detailed specifications and prices on a complete line of integrated materials handling equipment consisting of casters; running gear for trucks; standardized Load Carriers, with all types of accessories; portable lightweight wheel conveyors; hydraulic lift trucks; skid platforms; semi-skid platforms, and jacks, plus over 40 specialized units for handling materials. Profusely illustrated, the catalog also contains complete specifications and details of the Market Forge Load-Mobile, a storage battery operated lift truck tractor and freight truck.

1949-50 Engineering Undergraduate Award and Scholarship Program. The rules and conditions for the 1949-50 Engineering Undergraduate Award and Scholarship Program sponsored by The James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio, are presented in an illustrated 24-page booklet now generally available from The James F. Lincoln Arc Welding Foundation. In addition to the rules and conditions for participation in the program by engineering undergraduates, the booklet also contains information about previous award programs, including descriptions of some of the award winning papers. Suggested subject matter for student paper and a welding bibliography are also presented. The booklet contains 37 pictures, taken from previous award papers, which show some of the ideas on welding and its application for which awards have been received.

Arc-Welding Accessories. A 20-page catalog (GEC-253A) now available from the General Electric Co., Schenectady 5, N. Y., contains descriptions, specifications, illustrations, and prices of more than 150 arc-welding accessories, including electrode holders, helmets, goggles, tungsten electrodes, protective aids and clothing, electrode carriers, cable connectors, ground clamps, brushes, cleaning tools, fillet weld gages, and so on.

Dolly. Monarch Metal Products, Inc., 724 S. Columbus Ave., Mount Vernon, N. Y., is distributing Bulletin MH-749-1 illustrating and describing the Monarch "Little Giant" Dolly with capacity of 750 pounds.

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Guest Editorial

By **FREDERICK V. GEIER**, *President*
The Cincinnati Milling Machine Company

AMERICA has led the world because Americans have had more and better tools, and used them more productively. But to maintain a high standard of living, tools have to be replaced as fast as they wear out and whenever more productive new tools are available. Instead, tax regulations practically condemn America's tools to grow old and rust away. The usual way to provide replacement of tools and equipment is by depreciation—an annual setting-aside on the books to build up a replacement fund. If enough depreciation is taken, machinery and equipment can be kept up-to-date. The trouble is, Federal Income Tax policies act to force business to stretch out depreciation beyond the normal productive life of the machine. This blocks purchase of new equipment and keeps old and obsolescent equipment in operation long beyond its time. Whatever blocks the replacement cycle needed to keep America out in front unfortunately also penalizes the earning power of every American as a producer, and his cost of living as a consumer as well.

In the United States we have had the comfortable feeling that we could count on a continually rising standard of living. Actually the general welfare, the vitality and the progress of our economic way of life depend on three primary factors. These are:

1. A spirit of enterprise and risk-taking.
2. Management skill and resourcefulness in engineering, in production and in merchandising.
3. Productive tools and equipment, frequently renewed.

If enterprise and risk-taking are discouraged, if know-how in engineering, production or merchandising fails to keep pace, or if machinery and tools become worn and obsolescent, the economy will become static and the standard of living will suffer. If there is a lag in any one of these three factors—risk-taking, know-how, or equipment—there can be no vigorous, advancing economy. In Great Britain the transition from the vigorous economy of the nineteenth century to the comparatively static economy of more recent years has been one of the major factors contributing to the current economic difficulties of that country.

How do we measure up in the United States today? Clearly, our management know-how in engineering, production and merchandising has continued to advance. Equally clear, high taxes and political trends have put our spirit of enterprise and risk-taking under something of a cloud. Similarly, we have developed machines of advanced productivity, but America is falling behind in keeping its machine tool equipment up-to-date.

During the 1930's the industrial equipment of the nation was not being replaced as fast as it became obsolete or worn out. The deficiency in replacement of capital goods during the period was variously estimated at from \$50 to \$75 billion, without providing for the needs of a growing population or an improving standard of living.

From 1925 to 1940 the percentage of machine tools over ten years old then in use

rose from 44 percent to 72 percent. Notwithstanding the huge production of over 700,000 machine tools during the war period, by 1945 the percentage of overage machines, inclusive of war surplus machines in storage and in reserve, had only been reduced to 38 percent; whereas of those installed in private industry, 54 percent were over ten years old. A new inventory late this year might appear to indicate a halt in this obsolescent trend, but unless there is a sharp step-up in the building of new machine tools, in about four more years the percentage of overage machines in use will reach a record high. This simply means that a smaller percentage of American industry's machine tools will be up-to-date than ever before.

But if America's machine tool equipment is measured in terms of obsolescence, instead of mere physical age, the picture is even more disquieting. During the war period the emergency demand virtually froze the design of standard machine tools. Consequently, the great war-time output of machine tools was largely of prewar designs, and no appreciable numbers of postwar design machines were built until after the Machine Tool Show of September 1947. As a result, fully 95 per cent of the machine tools in use in the United States today are basically over 10 years old in design.

The marked advance in productivity of the postwar design machines over their prewar predecessors is not only well known within the industry, but is recognized by economic authorities such as Dr. Harold G. Moulton. In his recent book, "Controlling Factors in Economic Development," he states—"Modern machine tools are incomparably superior in performance to those of only two decades ago." He concludes his discussion of the scientific and technological factors by saying—"Improvements in the quality of capital instruments have been the cutting edge of economic progress."

Why, then, is America lagging in this key economic need to keep its machine tool equipment up-to-date? One of the most important factors is to be found in the Bureau of Internal Revenue's depreciation policies, which lead all other reasons given by users for failing to replace their old machine tools. Depreciation policies of tax authorities are well recognized as key factors in encouraging or blocking the modernization of industrial equipment. To build up its industrial power, Germany encouraged modernization with a 25 per cent depreciation allowance—stepping this up in one year to 100 per cent. Today, Great Britain allows a first year depreciation of 50 per cent; France, 15 to 30 per cent; Sweden, up to 100 per cent; Canada and Australia, up to 20 per cent.

In the United States our tax regulations are based on the supposition that various types of machine tools have a productive life of twenty to twenty-five years—resulting in depreciation rates entirely too low to keep America's machine tools up-to-date.

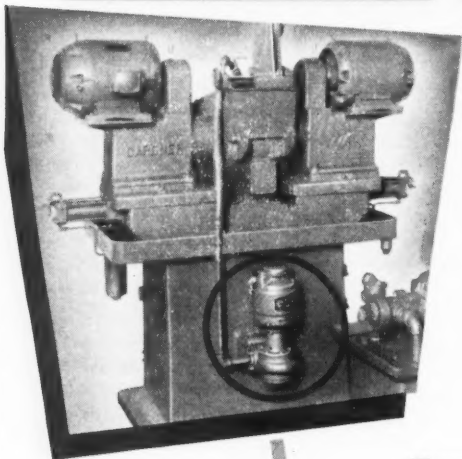
This is not a matter of interest just to machine tool builders. It goes to the root of the American standard of living and the defense and security of the nation and the American people. The foundation of our defense should rest on a highly productive, up-to-date industry ready for any emergency—not on obsolescent machines growing old and rusting away. Similarly, modern, productive tools are essential to give the worker a remunerative job and at the same time keep down the unit cost of goods produced so that the consumer's dollar will buy more. There is no better way to contribute to a rising standard of living for the American people—and it can't be done with old-style machinery.

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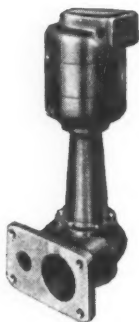
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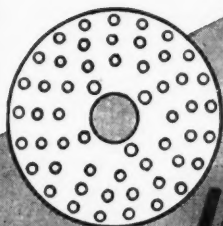
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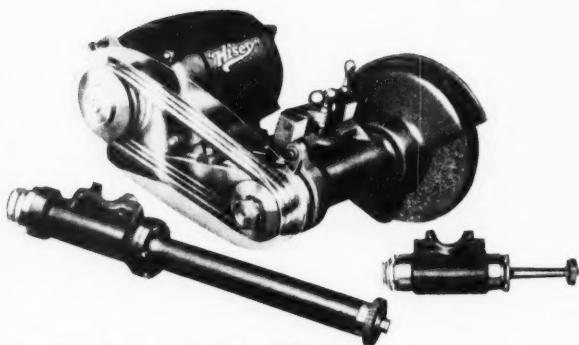
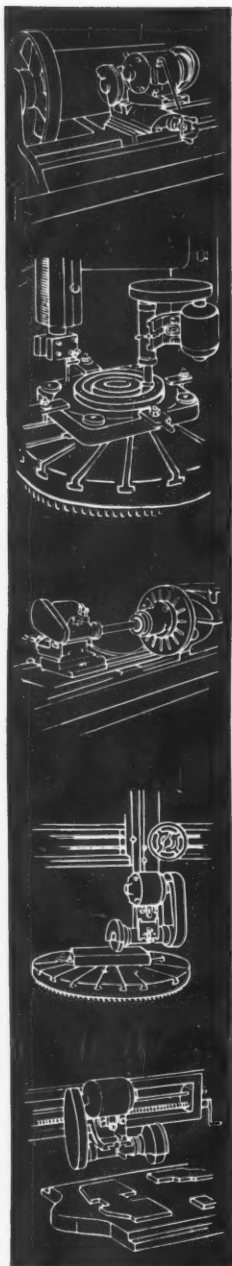
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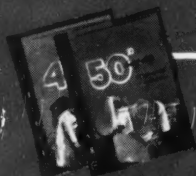
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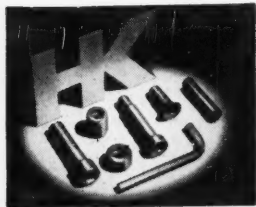
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